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NEWSLETTER IN CENTER FOLD

U.S. DEPARTMENT OF COMMERCE
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UNITED STATES DEPARTMENT OF COMMERCE

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U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

BIBLIOGRAPHY OF Technical Reports

January 1952

RESEARCH AND DEVELOPMENT AT THE NATIONAL BUREAU OF STANDARDS

Established by Act of Congress on March 3, 1901, the National Bureau of Standards has now completed half a century of service to science and industry. During these fifty years the Bureau's work has grown in keeping with the growth of science and technology. Today NBS is unique in the broad scope of its activities, for probably no other establishment embraces so completely the four major scientific fields of physics, mathematics, chemistry, and engineering.

As the principal laboratory of the Federal Government for research and development in these fields, NBS contributes to science in other research laboratories and industry through several important, general lines of activity. First, the Bureau conducts extensive programs in basic research, seeking continually to extend the frontiers of knowledge in the physical sciences. The majority of this investigatory work is carried on to provide improved techniques of physical measurement and to obtain more precise values for basic standards and physical constants as they are required by modern science. An example is the recent highly accurate measurement of the gyromagnetic ratio of the proton, or hydrogen nucleus which, in turn, has provided more precise values for the magnetic moment of the proton and the charge-to-mass ratio of the electron. Other important research programs deal with the basic properties of materials. Thus, in an effort to learn more about the fundamental structure of matter, the Bureau is investigating the properties of liquid helium and superconductors at temperatures near absolute zero, where many remarkable phenomena occur.

In addition to its general responsibility for basic research in the physical sciences, NBS undertakes major projects involving pure and applied research and development in accordance with the needs of the Federal Government. The atomic bomb project, for example, was initially centered at NBS as the Uranium Committee established in 1939 at presidential request. Post-war work in this field includes instrumentation projects and the development of measurement methods for standardizing radioactive materials. Another research program seeks to determine the mechanism of penetration of high-energy X-rays through barriers and to establish methods and standards of protection against harmful effects of such radiation. To provide a domestic source for a strategically important electrical insulating material, a synthetic mica having essentially the same properties as the equivalent natural mica has been developed. A broad program is under way on high-speed electronic computers. The properties of semiconducting materials are being investigated to evaluate their utility as rectifiers, transistors, and photocells. Other typical projects of a specific nature include the development of special optical instruments and optical glasses, radio beacons, the instrument landing system (ILS) for blind landing of aircraft, electronic ordnance devices, and guided missiles.

NBS is custodian of the national standards of physical measurement--ranging all the way from such gross quantities as the standard meter and kilogram to wave lengths of light and the momentum of electrons. All working standards in research laboratories and industry are calibrated in terms of these standards through the submission of master standards to the Bureau for comparison.1/ Thus, NBS assists industries in maintaining accurate standards of linear measurement by certifying master gage blocks to the American inch when this service is requested. NBS also distributes about 500 certified standard samples of chemicals, metals, ores, and ceramics to analytical and research laboratories for use in controlling chemical processes and in maintaining the accuracy of apparatus and equipment. Ultimately, every scientific instrument manufactured in this country depends for its precision and accuracy upon the Bureau's standards, measurements, and calibrations, which also provide the basis for mass production of machine goods.

The results of a large part of the research and development in such fields as building technology have a direct bearing on the development of technical requirements designed to assure safe working and living conditions. NBS thus provides a central source of information to which Federal, State, and municipal authorities, as well as industrial and trade associations, can turn when dealing with problems of safety or with building and plumbing codes. Recommended codes of engineering and industrial practice developed by NBS in cooperation with national organizations and other interested groups are published in the NBS Handbook series.

The Bureau's studies of the basic properties of materials provide a background that is useful in the testing of Government-purchased supplies to insure conformance to specifications. NBS also cooperates with the Federal Specifications Board and other standardizing agencies, such as the American Standards Association and the American Society for Testing Materials, in the development and improvement of purchase specifications and engineering standards. Considerable experimental investigation is carried on at NBS in the development of test methods, which are so often indispensable before a specification can be framed or applied. Other laboratory studies become necessary in connection with the continual revision of the specifications to keep them abreast of industrial practice and the changing needs of the Government.

The broad scope of the NBS program in the physical sciences, the wide range of facilities available for this work, and the diversified experience thus acquired by the staff lead inevitably to requests for technical and consulting services from other Federal agencies. These services constitute an important phase of the Bureau's work; in fact, every agency of the Federal Government, as well as many State and municipal governments, utilizes NBS in this capacity. The Bureau is also active in hundreds of technical committees, societies, associations, and committees organized to bring new advances of science into the technology of industry, and to establish uniform scientific standards throughout the world.

During World War II, a considerable portion of the research and development work carried on by NBS was concerned with national defense. The atomic bomb project has already been mentioned. Another large-scale program had as its object the more effective production of optical glass, an indispensable item in precision optical instruments for military as well as scientific and industrial use. The lack of scientific knowledge and manufacturing facilities in this field made it necessary to expand the experimental glass plant at NBS into a manufacturing unit. Research and experimental production were carried on simultaneously, resulting in improved equipment, more efficient operating methods, and several new types of optical glass for special uses. This work is being continued, with the cooperation of the armed services, as part of a coordinated series of projects basic to the production of all types of optical instruments. The various phases of the NBS program in this field are summarized in NBS Miscellaneous Publication 194, Research and Development in Applied Optics and Optical Glass at the National Bureau of Standards (15 cents), which also lists 195 Bureau publications pertaining to optical instruments and optical glass.

Another wartime program resulted in the only fully-automatic guided missile used operatively World War II--the BAT. NBS also had a large part in the development of radio proximity fuzes, which automatically explode projectiles at just the right time to cause maximum damage to the target. An important by-product of the Bureau's work on proximity fuzes was the development of techniques for printing conductors and resistors on insulating surfaces. The Bureau's pioneering work on printed circuits resulted in the first published report on this subject, NBS Circular 468, Printed Circuit Techniques (25 cents). In view of the interest thus aroused in industry, a symposium was held and the proceedings published as NBS Miscellaneous Publication 192, New Advances in Printed Circuits (40 cents). More recent reports in this field are Electronic Subminiaturization (OTS Report No. PB -100940, $4.75), and Printed Circuits (OTS Report No. PB-100950, $1.75). Several summary articles on developments in this field have also appeared from time to time in the NBS Technical News Bulletin.[2/]

Under the present national emergency, emphasis has again shifted toward development projects aimed at producing new weapons and materials for the Department of Defense. In an expanded program in closely guarded areas a variety of items of electronic ordnance are being developed for specific needs of the Army, the Navy and the Air Force.

At the same time, new and highly specialized electronic circuits and devices of importance to the peacetime economy are being developed at NBS, principally for other Government agencies. For example, the NBS Electronic Currency Counter was recently designed and constructed for the Treasury Department to count automatically old paper bills at the rate of 30,000 per hour. This device, which counts the bills by means of a beam of light and a photoelectric system, is expected to save the Government about a quarter of a million dollars annually. Other recent developments of perhaps more immediate interest to industry are an automatic temperature monitoring system, a low-frequency subminiature radio receiver, an electronic device for measuring the thickness of the oil film on a rotating shaft within a bearing, a high-temperature adhesive-tape resistor, a rotary printer for printing circuits on cylindrical surfaces, and a curing furnace for printed circuits. Most of these developments have been described in the NBS Technical News Bulletin.

The manifold expansion of the radio-frequency spectrum since World War II has created many problems concerning the behavior and properties of high-frequency radio waves. As a result, extensive studies of the ionosphere, of ionospheric propagation, ground effects, and climatological factors have been conducted. These studies have direct applicability to commercial radio and television. One phase of this work includes continuous monitoring of the ionosphere at various locations around the world, providing the basis for predictions

of the best frequencies to use at any time and place. These predictions are issued monthly by the Bureau as Basic Radio Propagation Predictions[3]; they are for a one-month period, three months in advance.

In mathematics, considerable progress has been achieved in developing and applying modern numerical methods to the solution of large sets of mathematical equations, in the compilation of specialized mathematical tables, in the application of modern statistical inference to complex engineering and sampling problems, and in the study of the theory of samples consisting of small numbers of specimens. Efforts are being made to develop new or improved techniques for numerical computation and to train mathematicians in the application of numerical methods. In this way, the use of mathematical techniques for the solution of technical problems is promoted and extended, bringing increased effectiveness to the national research program. The mathematical tables and other publications of the NBS mathematical laboratories constitute the NBS Applied Mathematics Series.

The increasing importance of mathematics in the analysis of military problems as well as in science and engineering led NBS into the field of electronic computers. SEAC--the National Bureau of Standards Eastern Automatic Computer--was completed last year and has been in operation day and night on problems in the physical sciences, logistics, and in the development of new machine technique. SEAC is the fastest general-purpose, automatically sequenced electronic computer in operation. A second machine-SWAC-- has been constructed, and the Bureau has also sponsored computer development projects by industry.

Many new mathematical methods and experimental techniques are being employed at NBS in an integrated approach to the study of high polymers. Recent developments in this branch of chemistry have created synthetic plastics, rubbers, and textiles. The Bureau's program seeks not only to improve present knowledge of high polymers but to develop new materials of this type and to provide for their practical application. An important phase of the work is the standardization of Government synthetic rubbers, which involves the development of methods both for chemical analysis and physical testing.

Recent NBS activities in the high-polymer field have resulted in the development of a paper composed entirely of glass fibers which should have extensive use in electronic equipment, new information on the road wear and power loss of tires, a process for increasing the durability of sole leather by impregnation with rubber, a new silicone resin pigment for marking clinical thermometers, an improved method for evaluating the quality of cellulose, and a rapid method for the quantitative determination of rubber hydrocarbon in crude natural rubber. NBS publications on plastics and rubbers are listed in NBS circular 494, Plastics Research and Technology at the National Bureau of Standards (15 cents), and NBS Miscellaneous Publication 185, Rubber Research and Technology at the National Bureau of Standards (10 cents), both of which also summarize the Bureau's activities in these fields.

Another major continuing program at NBS involves a unified approach to the problems of the construction industry. The work is so organized that groups are simultaneously engaged in investigations of properties of materials; structural strength; fire resistance; acoustics and sound insulation; heating, ventilating, and air conditioning; durability; exclusion of moisture; building and electrical equipment; plumbing; and other related projects. Attention is focused on methods of saving materials, on the use of less expensive and more readily available materials wherever feasible, and on the development of more economical designs based on information concerning the properties of materials which was not known a decade ago. Engineering principles are being applied to the design of houses, providing a complete and logical method for determining allowable loads for walls, floors, and roofs. This, in turn, makes it practicable to develop structural designs and to make use of non-conventional building materials that provide sufficient strength but require a minimum amount of material and labor. The results of the work in building technology are published as NBS Building Materials and Structures Reports. To date, 126 of these reports have been issued.

A large number of projects are carried on in the general field of aeronautics, principally for the NACA and the armed services. In addition to theoretical and experimental investigations in aerodynamics and aircraft structures, numerous special devices have been developed for use in aircraft or aircraft testing. Among these are the Ramberg vacuum-tube accelerometer, the NBS Stick-Force Indicator, and the Pfund sky compass.

Although jet engines are being increasingly utilized for high-speed flight, much research and development remains to be done in order to attain the desired reliability, economy, performance, and safety. Through continuing projects, sponsored by the military services, NBS is aiding in the solution of these problems. In addition to basic combustion studies and the development of temperature-sensing devices for jet engines, high-temperature coatings have been developed to protect metals and alloys used in jet engines against rapid deterioration from the effects of hot gases.

In automotive research, studies are directed toward the improvement of engines, fuels, tires, and accessories and the development of better methods for their evaluation. NBS has been active in this field since World War I, when a need for research on automotive problems first arose, and has contributed materially to the design and development of the test engines, equipment, and instrumentation now used to rate motor, aviation, and Diesel fuels. Since the development of standardized engine tests in 1932, NBS has served as the agency for the calibration of reference fuels, such as normal heptane and isooctane, used throughout the country for the knock rating of gasolines. These reference fuels are now available at a purity of 99.99 percent as a result of improvements in the Bureau's purification process. Recent studies, which provide a better

understanding of the mechanism of "knock" in automotive engines, are expected eventually to point the way toward further improvement of engines and fuels.

For many years, NBS has carried on an extensive program in metallurgy. This has included studies of the structure and properties of metals and alloys as well as investigations of failures of airplanes, automotive parts, and welded ships. Work on the corrosion of aluminum alloys in marine atmosphere--carried on for the Navy, the Air Force, and the NACA--has been instrumental in the development of modern high-strength, corrosion-resistant, light weight alloys for aircraft. The knowledge thus gained of the corrosion problems of light metals has recently been found of value in housing applications. Most of the work in metallurgy has been reported in the Journal of Research of the National Bureau of Standards.4/

In the field of scientific standards and measurements, continued research is conducted at NBS, even in areas often assumed static--e.g., length and time standards--in response to new or anticipated developments in other fields of science. Thus, the Bureau has been developing atomic standards of length, mass, and time in order to provide more precise measurements needed in atomic and nuclear physics and high-frequency communications. An atomic standard of length, which is now available to science and industry, consists of a lamp containing a milligram of mercury 198, an isotope obtained by bombarding gold with neutrons. The green radiation of mercury 198, when excited in a high-frequency field, is emitted with a reproducibility better than one part in a billion, and length measurements can be made with it with an accuracy of one part in 100 million. The Bureau's first atomic clock, based on the utilization of the constant frequency of vibration of the atoms in ammonia, providing a time constancy of one part in 10 million while a part in 10 billion appears feasible. Three new clocks -- two using ammonia and one using caesium -- are under development. New measurements of the magnetic moment of the proton promise to yield an atomic standard of mass in the future.

The National Bureau of Standards now employs about 4000 people, of whom approximately 1800 are technically trained. Scientific and technical activities are carried out in 15 divisions concerned with electricity, optics and metrology, heat and power, atomic and radiation physics, chemistry, mechanics, organic and fibrous materials, metallurgy, mineral products, building technology, applied mathematics, electronics, ordnance development, radio propagation, and missile development. Most of the Bureau's laboratories are located in Washington, but 21 field stations are maintained: the Institute of Numerical Analysis in Los Angeles, 12 radio propagation field stations, six test and inspection stations and two proving grounds.

Major facilities have recently been acquired at Corona, California, and Boulder, Colorado. At Corona land and buildings were transferred to NBS by the Navy, to accommodate electronic ordnance projects as well as other activities intended to make the laboratory a well-integrated research center in electronics and related fields. The Boulder Laboratories will house cryogenic engineering work and a radio laboratory.

The results of much of the Bureau's research and development are of direct interest to industry. These contributions are made available to the scientific and engineering world through publication either in the Bureau's own series of publications which may be obtained from the Superintendent of Documents or in the journals of scientific and professional societies. The Bureau itself publishes three monthly periodicals. These are the Journal of Research, which presents complete papers reporting technical investigations, the Technical News Bulletin, which presents summary reports on completed projects and preliminary reports on work in progress, and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: the Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications. Titles of nonperiodical publications and of reprints from the Journal of Research are listed in NBS Circular 460, Publications of the National Bureau of Standards (75 cents).

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Note: All NBS printed publications are available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

1/ Information on calibration services and fees can be found in NBS Circular 483, Testing by the National Bureau of Standards (25 cents).

2/ Available from the Superintendent of Documents, $1.00 a year, 10 cents a copy.

3/ Available from the Superintendent of Documents, $1.00 a year, 10 cents a copy.

4/ Available from the Superintendent of Documents, $5.50 a year.

Dr. A. V. Astin, Acting Director
National Bureau of Standards

CHEMICAL AND ALLIED PRODUCTS

Drugs and Pharmaceuticals

ACETYLCHOLINE-INDUCED VENTRICULAR FIBRILLATION, by Anne M. Kunkel, Aili H. Oikemus, B. P. McNamara, J. H. Wills. U. S. Chemical Corps. Medical Laboratories, Army Chemical Center, Md. Jun 1951. 14p diagrs, tables Microfilm $1.75, Photostat $2.50. PB 105602

1. Arrhythmia - Research 2. Adrenalin - Physiological effects 3. Choline, Acetyl - Physiological effects 4. Dibenamine - Physiological effects 5. Veratramine - Physiological effects 6. CC MD RR 63.

Project no. 4-08-02-008.

ANTIBODY RESPONSE OF ANIMALS EXPOSED TO X-RADIATION, III: THE PROTECTIVE EFFECT OF CHEMOTHERAPEUTIC AGENTS ON A SPECIFIC IMMUNE STATUS OF X-RADIATED MICE, by John D. Fulton, Anna C. Arnold, Roland B. Mitchell. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. 1951. 16p graphs, tables Microfilm $1.75, Photostat $2.50. PB 105469

A study was made to determine if treatment with adrenal cortical extract, thiourea, glutathione, Reticulose, and chloromycetin, either alone or in combination, would increase the survival time of mice immunized against Salmonella typhimurium, x-radiated, and subsequently infected with virulent S. typhimurium organisms. Under the conditions of the experiment it was observed that pre-radiation treatment with glutathione alone and post-radiation dosages of chloromycetin alone increased the survival time of immunized, x-radiated, and infected mice. The combination of pre-radiation glutathione and post-radiation chloromycetin increased the survival time considerably more than did either of the agents when administered alone. Administration of adrenal cortical extract, Reticulose, and thiourea immediately prior to x-radiation did not alter significantly the survival time of the infected experimental animals. AAF SAM Proj. 21-47-002, Report no. 3.

MECHANISM OF SEIZURES INDUCED BY DIISOPROPYL FLUOROPHOSPHATE (DT-P), by W. F. Bouzarth and H. E. Himwich. U. S. Chemical Corps. Medical Laboratories, Army Chemical Center, Md. Aug 1951. 19p drawing, diagrs Microfilm $1.75, Photostat $2.50. PB 105603

1. Diisopropyl fluorophosphate - Physiological effects 2. Waves, Brain 3. Brain - Effects of drugs 4. Choline, Acetyl - Neurological effects 5. CC MD RR 73.

Project no. 4-08-02-010.

REPORT OF RESEARCH ON HORMONES, SULPHA DRUGS, ETC, DURING THE WAR 1939-1945. Boehringer, C. F. & Söhne G.m.b.H., Mannheim, Ger. 1945. 18f Microfilm $1.75, Enlargement Print $3.75. PB 105429

1. Medical research - Germany 2. Amine acids - Research - Germany 3. Antimalarials - Research - Germany 4. Caffeine - Production - Germany 5. Glucosides - Production - Germany 6. Sulfonamides - Research - Germany 7. Theoleromine - Germany 8. Granocytan (Trade name) 9. Micro BIOS FD 1370/49, Frames 1-15.

Abstract included.

Detergents

STODDARD AND RELATED SOLVENTS, by James Kanegis. U. S. Office of Technical Services. Oct 1951. 13p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D.C. Mimeo: $.25. PB 105315

1. Solvents 2. Dry cleaning - Solvents 3. Skin - Irritants.

Plastics and Plasticizers

APPLICATION OF THE THEORY OF PERFECTLY PLASTIC SOLIDS TO STRESS ANALYSIS OF STRAIN HARDENING SOLIDS, by G. N. White, Jr. Brown University. Graduate Division of Applied Mathematics, Providence, R. I. Aug 1950. 31p diagr, graphs Microfilm $2.25, Photostat $5.00. PB 105584

A method is presented by which the stresses in a body of strain-hardening material may be found for those problems in which all strains are known and those in which some strains and some stresses are known. The basis of the method is the representation of stress in a strain-hardening material as the average of the stresses in similarly deformed, perfectly plastic elements with properly chosen yield strengths. The method is applied to the torsion and tension of thin-walled and solid circular cylinders, to the torsion and bending of thin-walled circular and rectangular tubes, and to a thick-walled cylinder under internal pressure. Contract N7onr-358, T. O. I, NR-041-032. GDAM TR 51.

EXPERIMENTAL INVESTIGATION OF THE LAWS OF PLASTICITY, 1ST REPORT, by Aris Phillips. Stanford University. Division of Engineering Mechanics, Stanford, Calif. Dec 1950. 23p photos, graphs Microfilm $2.00, Photostat $3.75. PB 105578

Experiments were performed with an Al 25-0 tube with a 0.75-in. i.d. and a 0.030-in. wall thickness to obtain information about the laws of plasticity. The tube was loaded in tension to a level below the elastic limit, then the tensile load was increased up to a certain level where torsional load was applied. Fifteen tests, each with a different loading program, were performed; the angle of twist and axial elongation were measured at each loading step. For each loading step, values were computed for the normal and shear stress, the increments of the normal and shear strains and the total normal and shear strains. The theory of plastic flow gave better results than the theory of plastic deformation when the value of the initial tensile stress was larger than 7000 p.s.i., while the theory of plastic flow was better for values less than 7000 p.s.i. Technical report no. 9 under Contract N6-onr-251, Task order 11 (NR-035-240).

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELAT-

ING TO ROTATING ELECTRIC MACHINERY. FOURTH QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 APR 1947-30 JUN 1947, by Milton Tenzer and Edward E. Boyno. Continental Electronics, Ltd., Brooklyn, N. Y. Jul 1947. 82p photos, graphs (part fold) tables Microfilm $3.75, Photostat $11.25. PB 105518

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Insulating materials - Plastics 4. Tape, Insulation - Tests 5. Impregnants - Research.

For final report see PB 98488; for 1st-3rd, 5th-7th see PB 105515-105517, 105519-105521.

PLASTIC BONDED SHELL MOLDING SIMPLIFIED. U. S. Bureau of Ships. Sep 1951. 6p photos Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.25. PB 105131

1. Molds, Plastic 2. Casting 3. Croning process (Molding) 4. NAVSHIPS IN 114.

RESEARCH ON THE PRINCIPLES AND PROCESSES IN THE BONDING OF METALS WITH PLASTICS, by I. F. Ehlers. 1944. 87f graphs, tables Microfilm $3.75, Enlargement Print $12.50. PB 105444

1. Adhesives - Plastic - Germany 2. Metals - Binding agents - Germany 3. Resins, Phenol formaldehyde - Germany 4. RTP/T1B T3278 5. Micro GDC 10/1486T 6. Micro BIOS FD 2797/49, Frames 1-82.

Abstract included. Abstract available as PB 105444s. 1p. Microfilm $1.25, Photostat $1.25.

Paints, Varnishes and Lacquers

FIRE RETARDANT PAINTS, by H. F. Mullikin and W. J. Mansbridge. Montana. Engineering Experiment Station, Bozeman, Mont. Oct 1950. 6p drawing, graph, tables Available from The Director Montana State College Engineering Experiment Station, Bozeman, Mont. PB 105233

1. Paints, Fire resistant 2. MO EES B7.

HIGH TEMPERATURE RESISTANT INSULATING VARNISH. QUARTERLY REPORT NO. 1, ON CONTRACT NO. W36-039-SC-36866, 1 JULY TO 1 OCTOBER 1948, by Dr. B. H. Kress, E. Armstrong. Vita-Var Corporation, Newark, N. J. Oct 1948. 58p diagrs, tables Microfilm $2.75, Photostat $7.50. PB 105670

1. Varnishes, High temperature resistant 2. Insulating varnishes.

HIGH TEMPERATURE RESISTANT INSULATING VARNISH. QUARTERLY REPORT NO. 4 ON CONTRACT NO. W36-039-SC-36866, 1 APRIL 1949 TO 1 JULY 1949, by Lee T. Smith and E. Armstrong. Vita-Var Corporation, Newark, N. J. Jul 1949. 33p tables Microfilm $2.25, Photostat $5.00. PB 105671

1. Varnishes, High temperature resistant 2. Insulating varnishes.

Department of the Army Project: 3-93-00-500. Signal Corps Project: 2005.

PRODUCTION PROGRAMME AND MANUFACTURING PROCESSES FOR REFINED WAXES. Lüneburger, Wachswerke A.G., Lüneburg, Ger. Oct 1945. 21f (Text in German) Microfilm $2.00, Enlargement Print $3.75. PB 105457

1. Waxes - Production - Germany 2. Paraffin wax - Oxidation - Germany 3. Paraffins - Catalysts - Germany 4. Micro BIOS FD 718/50, Frames 1-21.

English abstract available as PB 105457s. 1p. Microfilm $1.25, Photostat $1.25.

UTVÄNDIG MALNING AV TRÄ, DISKUSSIONSINLAGG VID EN KONFERENS DEN 26 FEBRUARI 1951 (EXTERIOR PAINTING OF WOOD, A DISCUSSION). Sweden. Statens Kommittee för Byggnadsforskning. 1951. 75p photos, diagrs (Text in Swedish) Microfilm $3.50, Photostat $10.00. PB 105591

1. Painting, Industrial - Sweden 2. Houses, Wooden - Painting - Sweden 3. Paints - Sweden 4. Sweden. Stations Kommittee för Byggnadsforskning. Rapporter nr. 24.

Summary in English. Photos will not reproduce well.

Chemical Engineering and Equipment

CORRESPONDENCE AND NOTES RELATING TO A PROJECTED DI-ISOPROPYL ETHER PLANT AT HEYDEBRECK. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 1943-1944. 60f drawings, diagrs, tables (Text in German) Microfilm $2.75, Enlargement Print $8.75. PB 105428

1. Diisopropyl ether - Production - Plants - Germany 2. Micro BIOS FD 1337/49, Frames 1-57.

English abstract included.

DRAWINGS OF CHEMICAL EQUIPMENT PROTECTED AGAINST INDUSTRIAL HAZARDS. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 1935-1945. 21f drawings (Legends in German and English) Microfilm $2.00, Enlargement Print $3.75. PB 105460

1. Chemical industries - Instruments and apparatus - Design - Germany 2. Crystallization - Machinery - Design - Germany 3. Flooring, Acid resistant - Germany 4. Micro BIOS FD 2831/49, Frames 1-19.

English abstract included. Abstract available as PB 105460s. 1p. Microfilm $1.25, Photostat $1.25.

PLANT AND VESSEL MANUFACTURE FOR THE CHEMICAL AND FOOD INDUSTRIES. COMPOSITE REPORT OF INTERROGATIONS OF HERR HEINRICH CANZLER OF CARL CANZLER G.M.B.H., DÜREN. TECHNICAL EDITOR: Dr. W. N. Hindley. British Intelligence Objectives Sub-Committee. 1946. 56f Microfilm $2.75, Enlargement Print $8.75. PB 105440

1. Containers, Chemical - Manufacture - Germany 2. Containers, Food - Manufacture - Germany 3. Aluminum - Fabrication - Germany 4. Copper - Fabrication - Germany 5. Steel, Stainless - Fabrication - Germany 6. Steel, Clad - Welding - Germany 7. Metals - Welding - Germany 8. Micro BIOS FD 3016/49, Frames 1-49.

C.I.O.S. Black list item 21. Abstract included. Abstract available as PB 105440s. Microfilm $1.25, Photostat $1.25.

PRODUCTION OF FORMALDEHYDE FROM METHANE. Gutehoffnungshütte A. G., Oberhausen, Ger. 1946. 15f drawings (Text in German and English) Microfilm $1.75, Enlargement Print $3.75. PB 105432

1. Formaldehyde - Production - Germany 2. Methane - Uses - Germany 3. Furnaces, Catalyst - Design - Germany 4. Micro BIOS FD 1402/49, Frames 1-13.

English abstract included.

QUARTERLY REPORT, JUNE 1-AUG 31, 1948 ON NAVAL PROJECT N6-ORI-158, TASK ORDER III, by L. F. Stutzman, H. A. Koch, Jr., H. A. Blum, Robert McCarter. Northwestern Technological Institute. Chemical Engineering Dept., Evanston, Ill. Aug 1948. 74p drawings (part fold), graphs (part fold), tables (part fold) Microfilm $3.50, Photostat $10.00. PB 105130

1. Carbon dioxide - Absorption by barium hydroxide 2. Carbon dioxide - Absorption by sodium 3. Gases - Absorption.

REPORTS AND NOTES ON CATALYSTS BS, BZ, BP, AND W. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 1938-1944. 98f drawings, diagr (Text in German) Microfilm $4.25, Enlargement Print $13.75. PB 105459

1. Catalysts, Hydrogenation - Preparation - Germany 2. Catalysts, Hydrogenation - Tests - Germany 3. Furnaces, Catalytic - Design - Germany 4. Micro BIOS FD 2215/49, Frames 1-96.

English abstract included. Abstract available as PB 105459s. 2p. Microfilm $1.25, Photostat $1.25.

Miscellaneous Chemicals

CATALYTIC HYDROGENATION OF THE CONDENSED RING SYSTEMS NAPHTHALENE, ACENAPHTHENE, AND FLUOROANTHENE, by Hilton A. Smith and Charles E. Crompton. Tennessee. University, Knoxville, Tenn. Sep 1949. 50p graphs, tables Microfilm $2.50, Photostat $6.25. PB 105072

The catalytic hydrogenation of naphthalene, acenaphthene, and fluoranthene was studied with respect to rate and path of reaction. Adams' platinum catalyst was employed in glacial acetic acid solvent at pressures up to 74 p.s.i. The reaction appeared to be zero order with respect to hydrogen acceptor although a definite competition existed between the various unsaturated species present. Thus, the reaction does not proceed in a stepwise manner. All three compounds exhibited the same general type of reaction pattern and, in addition, exhibited an abrupt increase in hydrogenation rate at some definite point during the reaction. The data indicate that the decreases in rate prior to the abrupt increases may be attributed to trace intermediates, condensation products or other by-products which, although present in minute amounts, seriously affect the reaction velocity. The first principal intermediate species formed in each case was the corresponding 1,2,3,4-tetrahydro derivative. Certain theoretical concepts are discussed which support this experimental observation. Contract N7 onr-390, Task order I.

CATALYTIC REDUCTION OF FREE FATTY ACIDS TO THE CORRESPONDING ALCOHOLS, by Manders. Sinclair Refining Co. Research and Development Dept. Apr 1951. 3p Microfilm $1.25, Photostat $1.25. PB 105304

1. Fatty acids - Reduction - Germany 2. Micro TOM 32-I Frames 160001310-14 translation.

Translation of TOM reel 32-I frames 160001310-14. Translation book 1951-43, June 1, 1940.

CRYSTAL HABIT MODIFICATION. FINAL REPORT ON CONTRACT N6 ORI-225, NR 057-053, TASK ORDER V, by Donald Tuomi and Preston Harris. Ohio State University Research Foundation, Columbus, Ohio. Aug 1949. 91p graphs, tables Microfilm $4.25, Photostat $12.50. PB 105044

The effect of the foreign cations Cd, Ni, Pd, and Mg on the growth of $NaBrO_3$ crystals has been studied. It has been found that these cations increase the allowed critical growth velocity for the growth of clear crystals of $NaBrO_3$, as well as changing the relative growth velocities of the two sets of tetrahedral faces normally present on pure $NaBrO_3$ crystals. Chemical analysis of the crystals grown in the presence of the Pb, Ni, and Cd ions shows that the Pb and Cd concentrations in the crystals are of a similar order of magnitude, for similar liquor concentrations, namely, 1 mole cation to 10^4 moles of $NaBrO_3$; but the concentration of Ni in crystals grown in the presence of Ni ions is less than 1 mole of Ni per 10^6 moles of $NaBrO_3$. Lattice constants of the crystals grown in the presence of the foreign cations were determined, but the variation in the lattice constants was not directly correlatable with the temperature of the powder sample or the concentration of the foreign cation in the crystal. The final average value at room temperature for the $NaBrO_3$ lattice constant was 6.70630 $\pm$ 0.00007 A. A hypothesis to account for the effect of the foreign cations on the crystal growth is presented.

CYLIC POLYOLEFINS. PART V: PREPARATION OF BROMOCYCLOÖCTADIENES AND 1,3,5-CYCLOÖCTATRIENE FROM 1,5-CYCLOÖCTADIENE, by Arthur C. Cope, Calvin L. Stevens and F. A. Hochstein. Massachusetts Institute of Technology. Dept. of Chemistry. Dec 1949. 26p graphs Microfilm $2.00, Photostat $3.75. PB 105254

Two isomeric monobromocycloöctadienes were isolated from the product formed by the reaction of 1,5-cyclooctadiene with N-bromosuccinimide. These compounds were interconvertible and appeared to be allylic isomers. The reaction of a mixture of these isomers with K t-butoxide yielded, 1,3,5-cycloöctatriene, which also was obtained by the reaction of 5,8-dibromo-1,3-cycloöctadiene with Mg. 5,8-Dibromo-1,3-cycloöctadiene was prepared from 1,5-cycloöctadiene and 2 equivalents of N-bromosuccinimide and purified by rapid distillation at 1 mm. Distillation at atmospheric pressure caused the dibromide to lose HBr and rearrange to a mixture of isomeric bromides containing α- and β-phenylethyl bromides. Contract N5 ori-07822, Project no. NR-055-96. Technical report no. 5. Prepared for publication in the Journal of the American Chemical Society.

DEHYDRATION OF CYCLOPENTANOLS. NAVAL RESEARCH CONTRACT N7ONR356, T. O. U, RE-

PORT FOR THE PERIOD DEC 1, 1948 TO OCT 1, 1949, by Stella L. Harris and George E. Woodward. Louisiana State University. Coates Chemical Laboratories. Oct 1949. 17p tables Microfilm $1.75, Photostat $2.50. PB 105079

1. Cyclopentanol - Dehydration.
Technical report II.

DISAGREEMENT BETWEEN CRYSTAL SYMMETRY AND X-RAY DIFFRACTION DATA AS SHOWN BY A NEW TYPE OF SILICON CARBIDE, 10H, by L. S. Ramsdell and J. A. Kohn. Michigan. University. Mineralogical Laboratory. n.d. 11p diagr, graph Microfilm $1.75, Photostat $2.50. PB 105356

The new 10H type of SiC is of interest, not only because it extends the remarkable range of known SiC structures, but because it reveals a marked variance between the observed diffraction data and the symmetry of the determined structure. The explanation of this variance is given, together with the morphological and structural details of the 10H type. Contract N6onr-232, T. O. IV.

ELECTRICAL PROPERTIES OF CERTAIN FLUORINATED HYDROCARBONS, by R. C. Bowers and T. D. Callinan. U. S. Naval Research Laboratory. Aug 1951. 11p photos, diagr, graphs, table Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50. PB 105295

The dielectric constant, loss factor, and volume conductivity of seven fluorocarbons were measured to determine their potentialities as liquid dielectrics. These compounds were perfluoromethylcyclohexane, perfluorodibutyl ether, perfluorodimethylcyclohexane, monochloropentade-cafluorodimethylcyclohexane a fluorinated mineral oil, perfluorotributyl amine, and an aliphatic perfluorocarbon. The latter two materials were found to have highly desirable insulating characteristics. NRL R 3836.

EXTENSION OF A TANAL (ISOOCTANE) PLANT AT HEYDEBRECK. PILOT PLANT FOR THE CONVERSION OF CO H_2 ACCORDING TO WINKLER/DUFTSCHMID. GAS SUPPLY FOR METHANOL PLANT WALDENBURG. PROJECT FOR A VANOL (GLYCOL SUBSTITUTE) PLANT AT HEYDEBRECK. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 1942-1943. 100f drawing, diagr (Text in German) Microfilm $4.25, Enlargement Print $13.75. PB 105456

1. Carbon monoxide - Hydrogen - Synthesis - Germany 2. Glycol - Substitutes - Germany 3. Isooctane - Production - Germany 4. Methanol - Production - Germany 5. Catalysts, Iron - Germany 6. Tanol (Trade name) 7. Vanol (Trade name) 8. I. G. Farbenindustrie A. G. - Plants - Germany 9. Micro BIOS FD 716/50, Frames 1-100.

English abstract available as PB 105456s. 2p. Microfilm $1.25, Photostat $1.25.

HEATS OF SOLUTION AND DILUTION OF ORTHO BORIC ACID AT 25°, BY JOE SMISKE AND L. S. MASON. TECHNICAL REPORT ON THE THERMAL PROPERTIES OF SOME HYDRIDES TO THE OFFICE OF NAVAL RESEARCH UNDER CONTRACT NO. N6 ORI 43, TASK ORDER I. Pittsburgh. University. Dept. of Chemistry. Feb 1950. 11p tables Microfilm $1.75, Photostat $2.50. PB 105291

The primary reaction in the combustion of $LiBH_4$ in a bomb was $LiBH_4 + 2\ O_2 = LiBO_2 + H_2O$. The $LiBO_2$ was identified by x-ray diffraction analysis. Some $LibH_4$ was thermally decomposed to elemental B and some of the $LiBO_2$ dissociated into LiO_2 and B_2O_3. Diluting the O with A caused more nearly uniform behavior. The heat of the primary reaction was $\Delta H = -14.8 \pm 1.0$ kg. cal./g. when allowance was made for the secondary reactions. When the $LiBH_4$ was burned with benzoic acid the secondary processes were reduced considerably. After allowing for them $\Delta H = -14.9 \pm 0.1$ kg. cal./g. $= -325 \pm 2$ kg. cal./mole.

LOW TEMPERATURE HEAT CAPACITY OF SODIUM HYDROXIDE. THE ENTROPY OF SODIUM HYDROXIDE AT 298.16°K, by Paul E. Snyder and John C. R. Kelly. Carnegie Institute of Technology. Dept. of Chemistry. Jun 1950. 21p drawing, diagr, graph, tables Microfilm $2.00, Photostat $3.75. PB 105292

The heat capacity of NaOH was determined from 62.52 to 300.17°K. A low-temperature adiabatic calorimeter was constructed with a Pt-10% Rh resistance thermometer-heater calibrated from -190° to +40°C. A constant-volume He gas thermometer was designed and constructed for the region below -190°C; the lowest temperature measured was -212°C. The entropy of NaOH at 298.16°K as determined by extrapolation of the low-temperature heat capacities of 0°K was calculated to be 15.32 ± 0.1 entropy units. Contract N6ori-47, Task order no. 8.

MEASUREMENTS OF THE THERMAL CONDUCTIVITY OF SODIUM AND POTASSIUM, by C. T. Ewing and J. A. Grand. U. S. Naval Research Laboratory. Aug 1951. 21p diagrs, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.75. PB 105058

In the application of liquid metals as high-temperature heat transfer media, existing conductivity coefficients were found to disagree by as much as 50% and 100%. The object of the present study was to design a reliable conductivity apparatus for liquids and to measure accurately values for several metals to approximately 600°C. Of the two major methods for measuring thermal conductivity, the longitudinal heat flow type with guard-tube compensation is shown to be better suited for liquids than the Forbes bar type or its modifications. A complete description of the apparatus and its component parts is presented. Some important considerations including radial heat exchange, calibration of thermocouples and measurement of temperature gradients, convection, measurement of heat flow, drift, etc., are treated extensively with emphasis on the source and magnitude of errors. Conductivity coefficients for high-purity sodium and potassium metals were measured. All reported results were measured with an absolute heat source and are therefore practically independent of any previous measurement. The calculated probable error for the average result was 1.0%, with a consistent precision of measurement better than 0.4%. The ideality of the pure liquid metal media is shown by the conformity of the conductivity values to empirical and theoretical postulations. NRL R 3835.

PRELIMINARY REPORT ON THE KINETICS OF THE THERMAL DECOMPOSITION OF DIBORANE, PREPARED BY RICHARD P. CLARKE, TRANSMITTED BY ROBERT N. PEASE, UNDER JOINT SPONSORSHIP OF PROJECTS BUMBLEBEE AND SQUID. Princeton University. Dept. of Chemistry. Jun 1949. 21p diagr, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105104

This is a progress report concerning an investigation of the kinetics of the thermal decomposition of diborane in a static system at temperatures up to 200°C and pressures below 200 mm. Hg. It has been possible to obtain the temperature coefficient for a postulated 3/2-order initial step. An approximate method of analysis of the volatile products has demonstrated the decomposition of B_5H_{11} upon the walls. Contract N6-ori-105, Task order III, phase 2, NR 220-038. Technical memorandum no. PR-14. Technical paper no. 47.

QUANTUM MECHANICS OF CHEMICAL KINETICS OF HOMOGENEOUS GAS PHASE REACTIONS. III: A COLLISION MODEL APPROXIMATION FOR INTRAMOLECULAR REARRANGEMENTS, by S. Golden and A. M. Peiser. Hydrocarbon Research, Inc., New York, N. Y. May 1950. 47p table Microfilm $2.50, Photostat $6.25. PB 105251

The model used assumed the existence of hard collisions between a reacting system and its surroundings. A quasi-stationary system resulted immediately after collision. It was in one of the states of the products if chemical transition had occurred or in one of the states of the reactants if transition was lacking. In both cases the probability distribution among the various states was assumed to be that corresponding to thermal equilibrium. This mechanism of hard collisions made it possible to refer to quasi-stationary wave functions of the reacting system immediately following a collision and provided a means of conserving the total energy and the translational momentum of a reacting system when this would not occur for the isolated system. The equation describing the rate of intramolecular rearrangement was successively of second-, first-, and zero-order as the total pressure (p) progressively increased. The unimolecular rate constant was proportional to the total p at small p's and became inversely proportional at large p's. Similar anomalies occurred due to the presence of inert gases in the reacting mixture. Heuristic considerations based upon the Arrhenius form for the rate constant led to the expectation of both small and large steric factors. Contract N6onr-86101, T. O. I, Project NR010 101. Technical report no. 1. Previous papers appeared in J. Chem. Phys. v. 17, p. 620 and p. 630 (1949).

STERIC EFFECTS OF REACTION RATES. STATUS REPORT ON RESEARCH PROJECT NR056 127, CONTRACT N7ONR-394, T. O. III, by Herbert C. Brown, Wilbur A. Murphey, Arno Cahn, M. Solomon, Raymond Horowitz. Purdue University, Lafayette, Ind. Jun 1950. 6p tables Microfilm $1.25, Photostat $1.25. PB 105365

Syntheses of the 3-Et, -iso Pr, and -tert-Bu pyridines, the 2-F, -Cl, and -Br pyridines, and the 3-F, -Cl, -Br, and -I pyridines are described. The physical properties of the 3-alkyl pyridines and their picrates are summarized. An investigation of the Me-alkyl-pyridine reactions indicated that amine formation was not favored with the exception of the reaction involving 2-tert-Bu pyridine. The vapor pressures of the synthesized 2- and 3-monohalopyridine-BF_3 addition compounds are tabulated. Heats of reaction were obtained for sixteen BF_3 addition compounds.

STERIC INHIBITION OF RESONANCE IN PENTACHLOROSTYRENE, by Turner Alfrey, Jr. and William Ebelke. Polytechnic Institute of Brooklyn, Brooklyn, N. Y. n.d. 3p tables Microfilm $1.25, Photostat $1.25. PB 105258

Pentachlorostyrene (I) was copolymerized with styrene and Me methacrylate, using Bz peroxide as a catalyst. The Q and e values for pentachlorostyrene were 0.2 and +0.25, respectively, where Q is a reactivity term, correlated with the degree of conjugation, and e a polarity factor. These values indicated that the substitution of Cl atoms in the ring reduces the reactivity of the styrene derivatives with free radicals. Steric inhibition of resonance of I was indicated, since in other chlorinated styrenes practically no change in reactivity was observed. Contract N6ori-206, Task order II.

STUDIES IN P-CYMENE: SULFOMATION OF 2-AMINO-P-CYMENE. FINAL REPORT UNDER CONTRACT N8 ONR-68000, 1 SEP 1948-31 AUG 1949, by Joseph N. LeConte and Norman M. Atkins. Georgia. University, Athens, Ga. 1950. 34p graphs, tables Microfilm $2.25, Photostat $5.00. PB 105373

Research in the sulfonation of 2-amino-p-cymene (I) included determination of the optimum condition for the reaction, the position of substitution of the SO_3H group, and the preparation and study of monoazo compounds. Direct sulfonation of 2-NH_2-p-cymene sulphate (II) with 1 mole of $H_2S_2O_7$ at 165° to 170°C and II with 20% $H_2S_2O_7$ at 0° to 10°C produced 67.5 and 53.9% yields, respectively; II with 96% H_2SO_4 at 160° to 170°C gave a 16% yield. Heating II on an oil bath at 180° to 190°C and a pressure of 2 to 6 mm. gave a yield of 80%. The optimum conditions for the sulfonation of I were indicated. Substitution of the SO_3H group occurred para to the NH_2 group regardless of temperature. The baking process for the sulfonation of aromatic amines gave yields as high as 80%. The preparation and general physical properties of p-aminonaphthyl- (III), β-hydroxynaphthyl-, and 5-hydroxycymyl-azo-2-p-cymyl-5-SO_3H are outlined; these azo dyes are not reported in the literature. The indicator and physical properties of cymyl orange, as reported by Wheeler and Waterman, were confirmed. III with a pH transition range of 5 to 7 appeared to have a more pronounced color change than Me red.

STUDY OF CYCLOBUTADIBENZENE AND CYCLOPENTINDENE. FINAL REPORT UNDER ONR CONTRACT NR 05175 (FORMER NO. N8-ONR-71900), by Henry W. Steinmann and Ian R. MacGregor. Cincinnati University. Dept. of Chemistry. Sep 1950. 20p Microfilm $1.75, Photostat $2.50. PB 105374

Research was conducted to synthesize cyclopentindene (I) and to compare its properties with those of its isomer, cyclobutadibenzene (II). The preparation of I involved indene and phenylcyclopentane derivatives which subsequently formed outer and inner 5-mem-

bered rings, respectively. The most successful approach was apparently the phenylcyclopentane derivatives. 1,2,3,9-Tetrahydrocyclopentindene (III) was prepared; dehydrogenation of III with S at 245°C and chloranil in boiling xylene gave polymeric products. III did not react with N-bromosuccinimide. (Since a brominated product is an intermediate in the indirect dehydrogenation of III, it appears to lead to I). Nine new compounds were synthesized as intermediates in the 7 routes investigated in the synthesis of I; in addition, 4 new compounds were indicated whose structures have not been determined. The unsuccessful attempt to obtain I resulted from excessive polymerization of either 4-hydroxy-1,2,3,9,10-pentahydrocyclopentindene or I.

SURFACE CHEMISTRY OF SILICA. I: CRYSTAL CHEMICAL CONSIDERATIONS, by W. A. Weyl. Pennsylvania State College. School of Mineral Industries, State College, Pa. Sep 1949. 16p drawing Microfilm $1.75, Photostat $2.50. PB 105087

1. Silica - Chemical properties 2. Crystals, Silicon 3. PSC SMI TR 11.

Contract N6 onr-269, Task order 8, NR 032-265.

UNTERLAGEN FÜR ARCHIV UND GESCHICHTE DER TECHNISCHEN ENTWICKLUNG DER GASFABRIK OPPAU (DATA FOR HISTORY OF TECHNICAL DEVELOPMENT OF THE GAS FACTORY AT OPPAU). BEITRAG ZUR BESTIMMUNG VON SO_2 NEBEN H_2S IN TECHNISCHEN GASEN (METHOD OF DETERMINATION OF SO_2 TOGETHER WITH H_2S IN TECHNICAL GASES) by Dipl-Ing. Roth and Dr. Phil Ohme. I. G. Farbenindustrie A. G., Oppau, Ger. Feb 1939. 30f tables (Text in German) Microfilm $2.00, Enlargement Print $5.00. PB 105446

1. Coke oven gas - Production - Germany 2. Water gas - Production - Germany 3. Gas - Manufacture - Germany 4. Gas - Consumption statistics - Germany 5. Hydrogen sulfide - Determination - Germany 6. Sulfur dioxide - Determination - Germany 7. Micro BIOS FD 724/50, Frames 1-29.

English abstract included. Abstract available as PB 105446s. 1p. Microfilm $1.25, Photostat $1.25. Tables show production of water gas, coke gas and power gas.

ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES

Communication Equipment

BIBLIOGRAPHY OF EXTRATERRESTRIAL RADIO NOISE, BY MARTHA ELIZABETH STAHR. PREPARED UNDER NAVY CONTRACT N6ONR-264, T.O. 6, NR077-321. Cornell University. School of Electrical Engineering, Ithaca, N. Y. Aug 1950. 116p Microfilm $4.75, Photostat $15.00. PB 105363

1. Noise, Extraterrestrial - Bibliography 2. Noise, Solar - Bibliography 3. Noise, Galactic - Bibliography 5. International Scientific Radio Union.

Radio astronomy report no. 11. Issued as part of the report of Commission V to the IXth. general assembly of the International Scientific Radio Union.

MONITOR TUNING INDICATORS FOR FSK RECEPTION, by C. E. Young. U. S. Naval Research Laboratory. Sep 1951. 23p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.75. PB 105410

The performance requirements essential for a tuning indicator suitable for tuning of FSK signals are clarified and several circuits whose parameters fulfilled these requirements are presented. Two cathode-ray-tube type indicators are developed from their elementary form. A CRT tuning indicator with a V-shaped collinear pattern appears to be optimum for ease and accuracy of receiver tuning. The indicator circuitry necessary to produce this collinear pattern is more extensive than that required to produce a simple two-line pattern, but the design is basically simple and reliable. Amplification of the frequency-shift discriminator output is usually required, irrespective of the tuning pattern employed. Final choice between the two patterns will usually be governed by the characteristics of the associated frequency-shift converter equipment, with the V-collinear preferred wherever possible. Appendices I and II provide simple expressions for the amplification of various forms of single-stage amplifier and for the simple cathode-coupled inverter-amplifier. The equations present, in a form which permits easy comparison and solution by inspection, information which is often difficult to locate. NRL R 3863.

RADIO FOR MERCHANT SHIPS: PERFORMANCE SPECIFICATION FOR AN EMERGENCY RECEIVER (WITH LOUD SPEAKER-WATCHING FACILITY) FOR SHIPS. Gt. Brit. General Post Office. 1951. 6p table Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.15. PB 105380

1. Radio, Marine - Equipment 2. Radio receivers - Loudspeaker-watching facility - Gt. Brit.

S. C. Code no. 43-167.

STATISTICAL CHARACTERISTICS OF SAMPLED AND INTEGRATED A-M AND F-M NOISE, by A. D. Watt. U. S. Naval Research Laboratory. Oct 1951. 29p diagrs, graphs Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.75. PB 105594

The characteristics of random noise have been determined. They are so presented as to permit a determination of the errors likely to occur in automatic types of communication systems. Most of the results have been analyzed mathematically as well as determined experimentally and are of a general nature which will permit their use with most communication or data-transmission systems. The results can be grouped as follows: I. Determination of the Effect of Integration upon Filtered Random Noise Fluctuations. The voltage fluctuations in the output of an integrating receiver are found to be of a Gaussian nature, provided, of course, that the input noise is Gaussian. Very little reduction in noise is obtained for integrating periods short compared to the bandpass of the filter. For periods of integration greater than effective bandpass, however, i.e., $\tau \Delta f > 1$, there is a considerable reduction in the noise fluctua-

tions. II. A-M Noise Characteristics. The effect of random noise upon an amplitude-modulated carrier is studied and the output distribution curves obtained for various input carrier-to-noise ratios. III. F-M Noise Characteristics. The effect of random noise upon a frequency-modulated carrier is analyzed under a number of circuit conditions. The output noise is found to have characteristics precluding use of a simple relationship between input carrier-to-noise and output signal-to-noise for various deviation ratios. A method is derived, however, which permits the fairly rapid construction of distribution integral curves for almost any set of f-m receiver parameters and carrier-to-noise ratios. These curves can be used to determine the relative errors in frequency-shift systems, such as teletype, etc. NRL R 3856.

Electronics

BIBLIOGRAPHY OF CHEMICAL REACTIONS IN ELECTRIC DISCHARGES, BY G. C. AKERLOF AND E. WILLS, PREPARED UNDER CONTRACT NONR-04401, PROJECT NR223-064. Princeton University, Princeton, N. J. Aug 1951. 250p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $5.00. PB 105558

1. Discharges, Electric - Bibliography.

Bibliography of references found in Chemical abstracts since 1920.

BIBLIOGRAPHY OF PHYSICAL-CHEMICAL PHENOMENA IN ELECTRIC DISCHARGES, BY G. C. AKERLOF AND E. WILLS, PREPARED UNDER CONTRACT NONR-04401, PROJECT NR 223-064. Princeton University, Princeton, N. J. Aug 1951. 242p. Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $5.00. PB 105545

1. Discharges, Electric - Bibliography.

Bibliography of references found in Chemical abstracts since 1920.

ELECTRON ENERGY LEVELS IN BARIUM OXIDE CRYSTALS, by R. L. Sproull, J. A. Krumhansl, W.W. Tyler, E. O. Kane. Cornell University. Dept. of Physics, Ithaca, N. Y. Dec 1950. 28p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105585

Measurements are presented on optical absorption and photoconductivity in BaO single crystals. The threshold photon energy is 3.8 e.v. and the absorption constant at higher energies is at least 10^5 cm^{-1}. A second increase in the absorption constant begins at about 4.8 v. and is not accompanied by photoconductivity. The observed dependence of photoconductivity on temperature and electric field strength indicates space-charge effects in limiting current flow. The onset of absorption at 3.8 e.v. is believed due to the production of excitons, with the accompanying photoconductivity due to thermal dissociation of excitons or exciton ionization of impurity centers. Tentative energy levels in BaO were established through results on soft x-ray emission spectra, optical absorption, semiconducting and thermionic properties and external photoelectric emission. Very small BaO crystals believed to contain excess Ba were grown from solution in Ba metal. These crystals are believed to contain excess Ba in appreciable concentration. Light-absorption studies in the visible spectral region indicate an absorption peak at about 2.3 e.v. The temperature dependence of this absorption is consistent with the presence of interstitial Ba and O vacancies. Technical report no. 3 under Contract N6ori-91, Task 11.

FUNDAMENTAL RESEARCH ON CATHODE EMITTERS, by G. A. Espersen, H. E. Farnsworth, R. Levi and M. J. Lun. Philips Laboratories, Inc., Irvington-on-Hudson, N. Y. Apr 1949. 68p photos, diagr, graphs, tables Microfilm $3.00, Photostat $8.75. PB 105089

1. Electrons - Emission 2. Thermionic emissions 3. Cathodes, Hot - Research 4. Rhenium - Thermionic emissions 5. Rhenium compounds - Thermionic emissions 6. Nickel-barium alloys - Thermionic emissions 7. Barium copper alloys - Thermionic emissions 8. Thorium oxide-rhenium alloys - Thermionic emissions 9. Thorium oxide-tungsten alloys - Thermionic emissions 10. Columbium-thorium alloys - Thermionic emissions 11. Tantalum-thorium alloys - Thermionic emissions.

Contract N6onr261, Task order I, NR074-071. Final report on Case no. 1329. Technical report no. 23. Contents: Report I. Preparation of rhenium emitters and measurements of their thermionic properties. - Report II. Secondary emission of nickel-barium mixtures and rhenium when bombarded by electrons with energies from 50 to 8000 electron-volts. - Report III. Thermionic emission properties of mixtures of barium with copper or nickel. - Report IV. Thermionic emission properties of thoria-rhenium and thoria-tungsten emitters. - Report V. Thermionic emission properties of columbium-thorium, and tantalum-thorium emitters.

HIGHLY STABLE FUSED QUARTZ COMPONENTS. FINAL REPORT UNDER CONTRACT NO. W36-039-SC-33660, by Fred E. Dickey. General Electric Co., Syracuse, N. Y. May 1949. 98p photos, drawings (part fold), diagrs, graphs, tables Microfilm $4.25, Photostat $12.50. PB 105504

This report describes the development, design and manufacture of a variable capacitor and fixed inductor type tuned circuit for the 2 to 6 MC range and a 23 to 250 uuf variable capacitor, both of which used fused quartz as the main structural material. These two units have been built to have the highest possible electrical and mechanical stability in order that they might either prove or disprove the feasibility of using fused quartz to produce electronic components which have low temperature coefficients. The tuned circuit had temperature coefficients of frequency of -16 1/2 parts per million per degree Centigrade at the high frequency end of its range and -9 1/2 ppm/°C at the low capacitance end of its range and +5 1/2 ppm/°C at its high end. These results, as well as the expense and difficulty of fabricating the units and their large size and weight, have showed that making electronic components of fused quartz to obtain low temperature coefficients is impractical. Techniques and equipment for measuring temperature coefficients of capacitors, inductors and tuned circuits have been developed and used to test the two fused quartz units built for this contract. A technique has been worked out for determining the separate coefficients of the capacitor and inductor which comprise a parallel

tuned circuit while testing them as a single unit. A technique has been developed for metallizing fused quartz with a silver paste and then electroplating with copper. A method has also been developed and demonstrated for metallizing a helix on quartz forms to make inductors. Dept. of the Army project: 3-26-00-600. Signal Corps project: 2006.

SELENIUM RECTIFIERS AT LOW TEMPERATURES. FINAL REPORT, by C. D. Crater. U. S. Signal Corps Engineering Laboratories, Fort Monmouth, N. J. n.d. 43p diagrs, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105274

It is the purpose of this report to review, in general terms, the operating principle and design of the selenium dry disc (blocking layer) rectifier and to present factual data of performance, at low temperatures, of products of typical commercial manufacturers. For interim report see PB 98992s. Dept. of the Army project no.: 3-91-02-800. Signal Corps project no. 2008-2. SCEL TM-M-1173A.

SUMMARY OF B-REGISTER/IN-OUT REGISTER TEST RESULTS, by George C. Sumner. Massachusetts Institute of Technology. Servomechanisms Laboratory. Apr 1949. 23p graphs (part fold) Microfilm $2.00, Photostat $3.75. PB 105127

1. Panels, Tests.

Memorandum M-827. Project Whirlwind.

THEORY OF HELICAL WAVEGUIDES AND HELICAL RADIATORS, by C. P. Hsu. Harvard University. Cruft Laboratory. Jan 1950. 36p diagrs Microfilm $2.25, Photostat $5.00. PB 105093

In Part I the propagation constant of an infinite helix is determined from an integral governing the tangential electric field on the surface of the helical conductor. The formulation is analogous to but more general than that given by Pocklington. The propagation constant thus obtained conforms generally to the experimental results for a helix used either as a waveguide in a traveling-wave tube or as a radiator in the normal and anomalous dispersion ranges (frequency ranges). In Part II the more difficult problem of a finite helix is treated. A differential equation for the current distribution function along the helix is "constructed" by a novel method involving the introduction of the singularity function of Dirac to take account of the boundary conditions at the ends and the finite size of the helical conductor. The solution using the method of the Laplace-Fourier Transform leads to a final Laplace integral in a form permitting its evaluation by the perturbation principle in an integral form. The final general solution effected through the calculation of the residues at the simple poles of a contour integral of Cauchy is quite comprehensive. All harmonic eigenfunctions of the "forced" modes, the "azimuthal free" modes, and the "superior- and inferior-interaction" modes naturally come out from successive applications of the perturbation principle. A variety of experimental observations on helixes such as ranges of the velocity of propagation, apparent variation of the phase velocity near fundamental and harmonic resonances, circular polarization of the field in the radiation zone, and different radiation field patterns in normal and anomalous frequency-dispersion ranges can be explained and correlated with the general theory presented here. Contract N5ori-76, Task order I, NR 078-011. HU CL TR 95.

WIDE RANGE, RETARDING-FIELD OSCILLATORS, by Jewell James Ebers. U. S. Air Materiel Command. Engineering Division. Components and Systems Laboratory. Jan 1950. 69p drawings, diagrs, graphs Microfilm $3.00, Photostat $8.75. PB 105694

Positive-grid or retarding-field oscillators are among the oldest generators of radio frequency power. Considerable confusion exists in the literature in regard to the energy conversion mechanism responsible for the oscillations. It is the purpose of this paper to clarify the electron mechanisms involved as well as to investigate the possibility of the application of such mechanisms to wide-range, high-frequency generators in the 3,000 to 30,000 Mc range. Several electron tube oscillators, of extremely wide tuning range, designed in accordance with the developed theory have been constructed and are described herein. Originally presented as a dissertation at Ohio State University on research under Contract W33-038-ac-15162: "Wide range tuning klystrons". AAF TR 6251.

WIDTH OF DEBYE-SCHERRER LINES FOR FINITE SPECTRAL WIDTH OF PRIMARY BEAM, by Hans Ekstein. U. S. National Advisory Committee for Aeronautics. Sep 1951. 9p diagrs Microfilm $1.25, Photostat $1.25. PB 105145

Width of a Debye-Scherrer line under the combined influence of spectral width of the primary radiation and of the small size of the crystal grains is calculated, omitting all geometric causes of line broadening. The shape of the crystals is assumed spherical, with the same diameter for all grains. The orientation is assumed to be random, with negligible statistical fluctuations. It is shown that the width under these circumstances is the sum of that width which is obtained with very large crystals ("spectral" width) and that which is obtained with monochromatic radiation ("size" width). NACA TN 2446.

Generators, Motors, Transmission Distribution, and Allied Equipment

LEAKY-CONDENSER OXIDE CATHODE INTERFACE, by A. Eisenstein. Missouri. University. Dept. of Physics, Columbia, Mo. Sep 1950. 33p photos, diagrs, graphs, table Microfilm $2.25, Photostat $5.00. PB 105360

The time dependence of current passed by commercial pentodes has been studied under pulsed conditions of operation. A decay of current is observed in the microsecond time range for those tubes operated for long periods under cut-off conditions. This decay has been interpreted in terms of the resistance and capacitance of the interface layer known to exist from x-ray diffraction studies. Techniques are developed and applied to the measurement of this interface resistance and capacitance as a function of temperature. Following the initial current decay, a partial recovery is observed when long pulses are used. This effect results from Joule

heating of the interface layer. Technical report no. 2 under Contract N7 onr-292, T. O. 5, Project NR 074 081.

SIMPLIFIED ANALYSIS OF R-C AND R-L NETWORKS, by Charles F. White. U. S. Naval Research Laboratory. Oct 1945. 33p diagrs, graphs, table Microfilm $2.25, Photostat $5.00. PB 105426

A method of analysis is developed by which the steady-state transfer characteristics of resistance-capacitance and resistance-inductance filter networks are readily obtained. The procedure depends upon an analysis of certain functions that are shown to be basic terms in the transfer characteristic equation for any such filter networks. The functions are as follows:

$$1 + p/w_o, \quad \text{and} \quad p/w_o$$

where p is defined as $\sqrt{-1}$ times 2π times frequency, and w_o is a constant. A set of design data charts is given for various combinations of resistance, capacitance, parallel resistance-capacitance, and series resistance-capacitance used in either the series or the shunt branches of an unsymmetrical "L" section network. NRL R 2668.

Miscellaneous

ALMOST SINUSOIDAL OSCILLATIONS IN NONLINEAR SYSTEMS. PART I: INTRODUCTION, SIMULTANEOUS OSCILLATIONS, by Johannes S. Schaffner. Illinois. Engineering Experiment Station, Urbana, Ill. May 1951. 62p diagrs, graphs Available from Engineering Experiment Station, University of Illinois, Urbana, Ill. $.60. PB 105165

A number of oscillatory phenomena occurring in electrical circuits are treated in a series of three bulletins. In this first bulletin an introduction to the theory of almost sinusoidal oscillations in nonlinear systems, its problems and methods, is given with particular emphasis on simultaneous oscillations. The other two bulletins treat the problems of synchronization and transient phenomena. All of these problems are handled by a simple uniform method in which the nonlinear element, such as a vacuum tube, is replaced by an "equivalent" linear impedance. The value of this linear impedance is chosen so that, in the first approximation, the behavior of the oscillatory system will remain the same. Once the circuit has been linearized methods well known to the electrical engineer can be applied to it. This procedure is a direct expansion of the theory of "equivalent linearization" developed by Kryloff and Bogoliuboff. The results obtained by it are identical with those calculated by more complicated methods. ILU EES B395.

INFLUENCE OF LOSSES ON ATTENUATION OF FOUR-TERMINAL IMPEDANCE NETWORKS. ELECTRICAL ENGINEERING SERIES VOL. 3, NR. 4 (ALSO KUNGL. TEKNISKA HÖGSKOLANS HANDLINGAR NR. 43), by Stig Brimberg. 1950. 30p diagr, graph, tables Microfilm $2.00, Photostat $3.75. PB 105277

An investigation has been carried out concerning the influence of the losses on electrical filters at peaks of the attenuation curve and at band edges, where the filter was at first assumed to be free from losses, the losses being introduced afterwards by means of the commonly used frequency transformation. In order to facilitate the calculations an assumption has been made concerning the behaviour of the complex image attenuation at frequencies corresponding to peaks of the attenuation curve and band edges. A similar assumption has also been made concerning the image impedance at band edges. Explicit expressions have been obtained for the peak value of the attenuation curve and for the variation of the value of the effective attenuation at band edges with resistance load. Theoretical as well as experimental tests with respect to the results in this paper have been made concerning a low-pass filter. The agreement has proved to be very satisfactory in spite of the fact that the given values of the loss angle of the impedance elements in the low-pass filter had not been fixed with particular exactitude. Acta polytechnica 78. Sweden. Kungl. Tekniska Högskolan. Handlingar no. 43.

SUPERSONIC SPOT WELDING, by Herr Hentzen. n.d. 2f photos Microfilm $1.25, Enlargement Print $1.50. PB 105439

1. Duralumin - Effect of ultrasonics - Germany
2. Welding, Spot - Effect of ultrasonics - Germany
3. Ultrasonics - Effect on welding - Germany
4. Micro BIOS FD 3025/49, Frame 1.

Abstract included. Abstract available as PB 105439s. 1p. Microfilm $1.25, Photostat $1.25.

SURVEY OF POLYVINYL CHLORIDE INSULATED CABLE, INTERIM MEMORANDUM, by A. M. Intrator. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. Oct 1950. 17p graphs, tables Microfilm $1.75, Photostat $2.50. PB 105173

The available technical literature regarding the properties of polyvinyl chloride and its use in electrical cable was surveyed. Replies from several manufacturers in response to inquiries concerning the properties and performance of their polyvinyl chloride insulated cables were evaluated and tabulated. The survey indicates that polyvinyl chloride has many outstanding characteristics that make it useful as an insulation for low-tension power cable. It is resistant to most of the mechanical and chemical abuses to which cables are often subjected and, in addition, has excellent electrical qualities. It is noninflammable, and can withstand long exposure to sunlight, moisture, oil, or salt spray without appreciable deterioration. Operating temperatures and voltages are prime limitations of polyvinyl chloride insulated cables. Because polyvinyl chloride insulation softens at high temperatures and becomes brittle at low temperatures its operating range is usually -10 C to 80 C (14 F to 176 F). This range can be widened by the use of different plasticizers but generally at the expense of some other characteristic such as inflammability or oil resistance. Technical memorandum M-008. Project YD-511-2.

X-RAY DIFFRACTION BY BENT CRYSTAL LAMELLAE, by Hans Ekstein. U. S. National Advisory Committee for Aeronautics. Sep 1951. 14p diagrs Microfilm $1.75, Photostat $2.50. PB 105136

A bent crystal lamella may be assumed to consist

of individual irregularly shaped blocks having mutual angular disorientation or to be regular in structure except for plastic deformation. The blocks were assumed to be of such a size that the kinematic theory would be valid. X-ray integrated intensity was calculated in the first case by adding the intensities of the individual blocks and in the second case by adding the amplitudes. Theoretical analysis indicated that, in both cases, moderate bending is not expected to change the integrated intensity or to cause broadening of the Debye-Scherrer lines. NACA TN 2448.

FOOD AND KINDRED PRODUCTS

CLOSTRIDIUM BOTULINUM IN CANNED BREAD. SAFETY TESTS ON CANNED BREAD INOCULATED WITH SPORES OF CLOSTRIDIUM BOTULINUM, BY DR. GAIL M. DACK AND JOAN L. KADAVY. REPORT NO. 10 UNDER CONTRACT W11-183-QM-5799 FOR PERIOD 1 SEP 1948 TO 31 DEC 1950. U. S. Quartermaster Food and Container Institute. Committee on Food Research. 1951. 8p tables Microfilm $1.25, Photostat $1.25. PB 105481

1. Bread, Canned 2. Clostridium botulinum - Culture 3. Chicago. University. Food Research Institute.

Termination report.

CONDENSATION OF WATER ON REFRIGERATED SURFACES, by J. K. Hardy, K. C. Hales and G. Mann. Gt. Brit. Dept. of Scientific and Industrial Research. Food Investigation Board. 1951. 43p diagrs, graphs, tables (1 fold) Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.40. PB 105228

1. Water - Condensation - Gt. Brit. 2. Heat - Transference 3. DSIR FI SR 54.

DETERIORATION IN WHEAT FLOUR AND PREPARED MIXES IN RELATION TO THEIR PERFORMANCE VALUE, BY W. F. GEDDES AND OTHERS. REPORT NO. 11 UNDER CONTRACT DA 11-183-QM-310 FOR PERIOD JULY 1, 1949-MAR 31, 1951. U. S. Quartermaster Food and Container Institute. 1951. 7p Microfilm $1.25, Photostat $1.25. PB 105483

1. Flour, Wheat - Fat deterioration 2. Minnesota. University. Division of Agricultural Biochemistry.

Termination report.

FUNGICIDAL SCREENING TESTS FOR THE CONTROL OF DECAY IN FLORIDA ORANGES, by J. R. Winston, G. A. Meckstroth, G. L. Roberts and Randall H. Cubbedge. U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering. Division of Handling, Transportation and Storage of Horticultural Crops, Orlando, Fla. Aug 1951. 27p table Microfilm $2.00, Photostat $3.75. Limited supply available free from Division of Handling Transportation and Storage of Horticultural Crops, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Md. PB 105246

1. Citrus fruit - Decay.

H. T. & S Office report no. 253.

INCIDENCE OF PUTREFACTIVE ANAEROBIC SPORES IN MEAT PRODUCTS, BY JOHN C. AYRES, MARTIN BURKE AND KEITH STEINKRAUS. REPORT NO. 14 UNDER CONTRACT W11-183-QM-7961 FOR PERIOD COVERING 16 JUNE 1949-15 SEP 1950. U. S. Quartermaster Food and Container Institute. 1950. 3p Microfilm $1.25, Photostat $1.25. PB 105484

1. Meat, Canned - Bacteria content 2. Bacteria, Anaerobic 3. Iowa. Agricultural Experiment Station, Ames, Ia.

Termination report.

NUTRITIVE VALUE OF ARMY RATIONS, BY G. A. ELVEHJEM. REPORT NO. 28 UNDER CONTRACT NO. W11-183-QM-8124 FOR PERIOD JULY 1, 1950 TO JUNE 30, 1951. U. S. Quartermaster Food and Container Institute. 1951. 3p Microfilm $1.25, Photostat $1.25. PB 105480

1. Food rations - Nutritive value 2. Vitamin B_6 3. Wisconsin. University. Dept. of Biochemistry.

PROCESSING OKRA SEED FOR OIL RECOVERY, by C. Ray Holbrook, Jr. and A. Cecil Wamble. Texas. Engineering Experiment Station. Oct 1951. 16p drawing, tables Available from Texas Engineering Experiment Station, Texas A. and M. College System, College Station, Texas. PB 105621

Experiments indicate that okra seed can be satisfactorily cleaned, hulled, separated, cooked, and pressed by equipment conventionally used in cottonseed oil mills. The cleaning of okra seed is easily accomplished by the use of a simple shaker ahead of the hullers. The scalping shaker, found in many cottonseed oil mills, will do a satisfactory job of cleaning when clothed with two sizes perforated metal -- one for the okra seed to pass through and another for the seed to pass over. An aspirator on the end of the shaker to remove light shale from the seed could be used to keep this material from going through the hullers and screens. Okra seed can be hulled and separated satisfactorily with equipment usually used on cotton seed. Certain changes in metal sizes and other adjustments of the cottonseed equipment are required. Humidifying of the okra seed does not appear to be necessary. In processing of the okra seed meats, hydraulic cottonseed equipment is suitable. Best cooking results are obtained in 20 minutes at 245°F. Okra seed of high free fatty acid content, like cottonseed, can be expected to yield less oil of lower grade than low acid seed. A cooperative investigation by the Cotton Research Committee of Texas and the Texas Engineering Experiment Station. TU EES RR 29.

REPORT OF THE FOOD INVESTIGATION BOARD WITH THE REPORT OF THE DIRECTOR OF FOOD INVESTIGATION FOR THE YEAR 1949. Gt. Brit. Dept. of Scientific and Industrial Research. Food Investigation Board. 1951. 40p Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.40. PB 105616

1. Food - Inspection - Gt. Brit.

S. O. Code no. 47-7-0-49.

STUDY OF THE PHYSICAL AND CHEMICAL CHANGES OCCURING IN BREAD DURING STORAGE, BY W. F. GEDDES AND OTHERS. REPORT NO. 17 UNDER CONTRACT DA 11-183-QM-20 FOR PERIOD JULY 1, 1949 TO DEC 31, 1950. Quartermaster Food and Container Institute. 1951. 5p Microfilm $1.25, Photostat $1.25. PB 105482

1. Bread - Storage - Chemical changes 2. Bread - Storage - Physical changes 3. Minnesota. University. Division of Agricultural Biochemistry.

Termination report.

VERFAHREN ZUR HERSTELLUNG VON KAUGUMMI AUF SYNTHETISCHER GRUNDLAGE (PROCEDURE FOR PRODUCTION OF CHEWING-GUM ON A SYNTHETIC BASE), by Dr. Karl Mienes. Dynamit A. G., Troisdorf, Ger. 1947. 8f drawings (Text in German and English) Microfilm $1.25, Enlargement Print $2.50. PB 105427

1. Gum, Chewing - Manufacture - Germany 2. Oppanol (Trade name) 3. Micro BIOS FD 1411/49, Frames 1-7.

Abstract included.

FUELS AND LUBRICANTS

ACETYLENE INDUSTRY AND ACETYLENE CHEMISTRY IN GERMANY DURING THE PERIOD 1939-1945, BY THE JOINT PANEL OF THE DEPT. OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND THE MINISTRY OF SUPPLY. British Intelligence Objectives Sub-Committee. 1951. 157p tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.90. PB 105693

1. Acetylene - Production - Germany 2. Acetylene - Uses - Germany 3. Acetylene chemistry - Germany 4. BIOS OR 30.

Contents: Part I: Industrial production and use of acetylene, by R. Owens. - Part II: Acetylene chemistry, by A. W. Johnson.

EXPERIMENTAL INVESTIGATION OF OIL FILM PRESSURE DISTRIBUTION FOR MISALINED PLAIN BEARINGS, by G. B. DuBois, H. H. Mabie and F. W. Ocvirk. U. S. National Advisory Committee for Aeronautics. Oct 1951. 89p photos, diagrs, graphs, table Microfilm $3.75, Photostat $11.25. PB 105497

Effect of axial and twisting misalining couples on oil film pressure distribution of a loaded bearing was determined. Test data were obtained with a 1.62- by 1.62-inch bearing at a shaft speed of 5000 rpm, a centrally applied load giving 833 pounds per square inch on projected area, and with or without misalining couples. Five three-dimensional plaster models were made to represent the test data obtained under the various conditions. Profile curves of oil film pressure distribution as well as curves showing distribution of bearing temperature are included. NACA TN 2507.

GENERAL PRODUCTION PLAN AND METHODS. SPECIFICATIONS FOR CARBURETOR AND DIESEL FUELS FOR THE ARMED FORCES. ROAD TESTS WITH ALCOHOL FUEL. Deutsche Gasolin A. G., Berlin. Jul 1944-Oct 1945. 31f tables (Text in German) Microfilm $2.25, Enlargement Print $6.25. PB 105448

1. Gasoline - Production - Germany 2. Fuels, Diesel - Production - Germany 3. Fuels, Diesel - Specifications - Germany 4. Fuels, Aviation - Specifications - Germany 5. Lubricating oils - Specifications - Germany 6. Fuels, Automotive - Alcohol content - Tests - Germany 7. Micro BIOS FD 727/50, Frames 1-29.

English abstract included. Abstract available as PB 105448s. 2p. Microfilm $1.25, Photostat $1.25.

INFLUENCE OF THE ARRANGEMENT AND DESIGN OF FUEL JETS ON IGNITION IN OPEN COMBUSTION EXPERIMENTS, by Dr. Karl Meier. Germany. Luftfahrtforschungsanstalt. 1946. 37f Microfilm $2.25, Enlargement Print $6.25. PB 105431

1. Fuels - Injection - Germany 2. Jets - Design - Germany 3. Combustion - Research - Germany 4. Micro GDC 2569T 5. Micro BIOS FD 736/49, Frames 1-31.

Abstract included. LF-159.

METHOD FOR IMPROVING THE PERFORMANCE OF FUELS FOR INTERNAL COMBUSTION ENGINES BY THE ADDITION OF WATER, by Alexis Argamakoff. Jul 1945. 44f photos, graphs (Text in German and English) Microfilm $2.50, Enlargement Print $7.50. PB 105454

1. Fuels, Aviation - Water content - Germany 2. Fuels, Automotive - Water content - Germany 3. Fuel additives - Germany 4. Micro BIOS FD 65/50, Frames 1-42.

English abstract included. Abstract available as PB 105454s. 2p. Microfilm $1.25, Photostat $1.25.

PREPARATION OF HYDROGENATION CATALYSTS, NOTES ON HYDROFORMING BENZINE, AND ON THE BROCHHAUS PLAN FOR WORKING UP AUSTRIAN MINERAL OIL. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 1939-1942. 92f drawings, diagrs tables (Text in German) Microfilm $4.25, Enlargement Print $13.75. PB 105455

1. Catalysts, Hydrogenation - Preparation - Germany 2. Mineral oils - Production - Austria 3. Hydroforming process - Germany 4. Micro BIOS FD 715/50, Frames 1-90.

English abstract included. Abstract available as PB 105455s. 1p. Microfilm $1.25, Photostat $1.25.

PRODUCTION OF OILS, ANTI-CATERPILLAR GLUES, AND PARAFFIN WAX EMULSIONS FOR THE PAPER INDUSTRY. INVESTIGATIONS INTO THE CORROSION OF LEAD DRYING TOWERS. PROPERTIES OF LEAD, by Dr. W. Hoffmann. Rhenania-Ossag Mineralölwerke A. G., Hamburg, Ger. 1942-1945. 62f drawings, diagrs, graphs, tables (Text in German) Microfilm $3.00, Enlargement Print $10.00. PB 105447

1. Oils - Production - Germany 2. Fuels, Diesel - Tests - Germany 3. Glue, Anti-caterpillar - Germany 4. Insect repellents - Germany 5. Lead - Corrosion - Germany 6. Lead - Properties - Germany 7. Paraffin wax - Chlorination - Germany 8. Paraffin wax - Emulsions - Germany 9. Steel -

Hardening - Germany 10. Micro BIOS FD 726/50, Frames unnumbered.

English abstract included. Abstract available as PB 105447s. 1p. Microfilm $1.25, Photostat $1.25.

PRODUCTION PROGRAMME AND MANUFACTURING METHODS FOR OILS AND GREASES. Schliemann's, Ernst, Oelwerke G.m.b.H., Hamburg, Ger. 1945. 22f (Text in German) Microfilm $2.00, Enlargement Print $5.00. PB 105453

1. Greases - Manufacture - Germany 2. Oils - Production - Germany 3. Micro BIOS FD 723/50, Frames 1-21.

English abstract included. Abstract available as PB 105453s. 1p. Microfilm $1.25, Photostat $1.25. Supplements information on this firm in BIOS FR 1831, p. 39-41.

SPREADING OF LIQUIDS ON LOW-ENERGY SURFACES. II: MODIFIED TETRAFLUOROETHYLENE POLYMERS, POLYETHYLENE, AND PARAFFIN, by H. W. Fox and W. A. Zisman. U. S. Naval Research Laboratory. Aug 1951. 17p graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.50. PB 105057

Contact-angle measurements have been made of a number of liquids on fluorinated polymers, polyethylene, and paraffin. The work of adhesion and spreading coefficient have been calculated for each system solid/liquid where the liquid was nonspreading. It was found that substitution of chlorine or hydrogen for fluorine in the fluorinated polymers results in an increase of free surface energy of the solid, the amount of increase depending on the proportion of nonfluorine substituents. It is shown that the experimental results can be explained by consideration of the "compatibility" of a given liquid with a given solid together with the critical surface tension of the solid. Compatibility is greatest when the liquid/solid interfacial tension is least. Data are given for the contact angles on paraffin of a number of nonpolar liquids including some n-alkanes. Thus it is shown experimentally that there are many exceptions to the rule that nonpolar liquids spread on nonpolar solids. There appears to be a maximum value of the work of adhesion characteristic of each solid, numerically equal to about three times the critical surface tension. NRL R 3845.

TECHNICAL REPORT ON THE RUHR COALFIELD, VOL. III, PT. II: REPORT ON AUTOMATIC CAR LOADING AND CAR CONTROL AT LOADING POINTS, AND ON CAR DESIGN, INCLUDING COUPLINGS, BUFFERS AND SPRINGS, by A. Tait and W. Roberts. Gt. Brit. Ministry of Fuel and Power and British Intelligence Objectives Sub-Committee. 1949. 57p drawings (part fold) Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 105311

1. Coal handling machinery - Germany 2. Coal mines and mining - Cars - Design - Germany 3. Coal mines and mining - Germany 4. British Intelligence Objectives Sub-Committee 5. BIOS FR 1685.

S. O. Code no. 41-93-22.

ZUR FRAGE DER GRENZREIBUNG UND GRENZSCHMIERUNG (BOUNDARY FRICTION AND OILINESS), by Dr. Walther Bock. Germany. Luftfahrtforschungsanstalt. Dec 1946-Jun 1947. 86f drawings, diagrs, graphs, tables (Text in German) Microfilm $3.75, Enlargement Print $12.50. PB 105345

1. Friction layer - Germany 2. Lubricants, Extreme pressure - Germany 3. Lubricating oils - Additives - Germany 4. Micro GDC 2482 5. Micro BIOS FD 2229/48, Frames 1-82,

English abstract included.

HIGHWAYS AND BRIDGES

LANDSLIDES, A SELECTED ANNOTATED BIBLIOGRAPHY, COMPILED by Jessie M. Tompkin and Severine H. Britt. Highway Research Board. 1951 57p Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $.90. PB 105422

1. HRB B10.

LOAD CARRYING CAPACITY OF ROADS AS AFFECTED BY FROST ACTION. HIGHWAY RESEARCH BOARD. PRESENTED AT THE 30TH ANNUAL MEETING, 1951. Oct 1951. 42p maps, photo, diagrs, graphs, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $.75. PB 105559

1. Roads - Surface treatment - Frost damage 2. Frost damage 3. Soils - Freezing effects 4. HRB B40.

Contents: Project no. 7 Committee report, by C. L. Moth-Effect of temperature on the bearing value of frozen soils, by Miles S. Kersten and Allen E. Cox.

PROCEEDINGS OF THE 30TH ANNUAL MEETING HELD AT WASHINGTON, D, C., JAN. 9-12, 1951. HIGHWAY RESEARCH BOARD. EDITORS: Roy W. Crum, Fred Burggraf, W. N. Carey, Jr. 1951. 558p photos, drawings, diagrs, graphs, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., Washington 25, D. C. $7.50. PB 105212

1. Roads - Research.

Contents: Economics, finance and administration, H. S. Fairbank, Chairman. - Design, C. N. Conner, Chairman. - Materials and construction, C. H. Scholer, Chairman. - Maintenance, W. H. Root, Chairman. - Traffic and operations, Wilbur S. Smith, Chairman. - Soils, Harold Allen, Chairman.

RECOMMENDATIONS FOR PLASTIC WHITE LINE MARKINGS. Gt. Brit. Dept. of Scientific and Industrial Research. Road Research Laboratory, Harmondsworth, England. 1951. 9p tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.15. PB 105328

1. Road markers, Plastic white line - Gt. Brit. 2. DSIR RRL RN 9.

S. O. Code no. 47-141-9.

SOIL COMPACTION, PAPERS PRESENTED AT THE 30TH ANNUAL MEETING, 1951. Highway Research Board. Nov 1951. 25p photos, diagrs, graphs Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $.60. PB 105630

Sinacori explains the experimental use of a pneumatic-tired roller to compact refuse fill for an arterial project in New York. The roller can be varied in weight from 12 tons (empty) to 50 tons (filled with sandbags). It was found that the 50-ton roller tended to bog down in the soft fill. Best rolling results were obtained when the area was rolled in two stages: first stage requiring no more than 8 passes with roller weighing 30 tons; second stage requiring up to 30 passes with roller weighing 50 tons. Sinacori's paper also includes a set of recommended tentative specifications for special embankment foundation rolling. In his paper on earth compaction, Dr. Krynine examines compaction terminology and proposes certain revisions in the terms used. He particularly calls attention to the different types of tamping rollers, often grouped together as "sheepsfoot" rollers, and points out the sheepsfoot is only one type of tamping roller. Dr. Krynine also gives examples of how to choose between the dry and the wet side of the optimum moisture content. Contents: Compaction of unstable material with heavy pneumatic tired roller, by M. N. Sinacori. - Some comments on earth compaction, by D. P. Krynine. HRB B42.

INSTRUMENTS

CHARACTERISTICS OF NAVY MEDIUM-WEIGHT HIGH-IMPACT SHOCK MACHINE, by R.W. Conrad. U.S. Naval Research Laboratory. Sep 1951. 41p photos, drawings, diagrs, graphs, tables Available from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D. C. $1.25. PB 105297

A study was made of the Medium-Weight High-Impact Shock Machine to determine the magnitude, frequencies, and general characteristics of the shock developed by this machine under specification operation. A comparison of data is intended to correlate this shock to shipboard shock experienced in actual combat and to compare the shocks delivered by other machines of a similar type. Records were made of the motions on the load and on the anvil table for four types of loading, for three distances of anvil-table travel, and for hammer drops corresponding to Class A and B tests of standard military specifications plus additional blows equivalent to 150 percent of Class A and 50 percent of Class B blows. Both bolt-spacing distances allowed by the rectangular load dimensions were tested for each load weight, resulting in a total of eight distinct runs. Relationships between peak measurements of acceleration and velocity on the anvil table and load are shown to be linearly related to the hammer-impact velocity. Motions resulting from anvil-table reversal are discussed, and it is shown that this secondary shock can be the largest under certain conditions. Theoretical equations of motion are developed and their correspondence to experimental data demonstrated. NRL R 3852.

EFFECT OF CURRENT VARIATION ON THE OUT-OF BALANCE OF STRAIN GAUGE BRIDGES, by J. B. B. Owen. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jan 1947. 5p diagr, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.40. PB 105334

This note gives test results which show that the out-of balance current in a Wheatstone bridge consisting of four unstrained resistance strain gauges increases at first sensibly in proportion to the applied bridge voltage, i.e. the current through the gauges. This is as expected. Then as the gauge current increases the out-of-balance current departs appreciably from this linear law by an amount approximately proportional to the cube of the gauge current. Any errors in resistance compensation against temperature changes between gauge and gauge might be expected to increase with the current squared, and the consequent out-of-balance current in the galvanometer due to this effect as the current cubed. This is probably the explanation of the effect found. Due to the presence of this effect in strain gauge installations, null point methods of measuring bridge out-of-balance due to strain will be inaccurate at high gauge circuits unless the current is kept constant. The advantage of the null point method in that the result is independent of the applied voltage, is thus lost. Cover date is 1951. S. O. Code no. 23-2497. ARC RM 2497.

EFFECTS OF PRESSURE-RAKE DESIGN PARAMETERS ON STATIC-PRESSURE MEASUREMENT FOR RAKES USED IN SUBSONIC FREE JETS, by Lloyd N. Krause. U. S. National Advisory Committee for Aeronautics. Oct 1951. 20p diagrs Microfilm $1.75, Photostat $2.50. PB 104954

A subsonic-free-jet investigation was conducted to determine the effect of pressure-rake design parameters on static-pressure measurement. The design parameters investigated include: the location of the static orifices in relation to the tube nose and supporting strut; the proximity effects of adjacent tubes near the static orifices; and the effect of ratio of support diameter to jet diameter. The investigation covered a Mach number range of 0.3 to 0.95. Information and recommendations are provided for the design of pressure rakes to be used in subsonic free jets. NACA TN 2520.

FREQUENCY MULTIPLIER FROM 100 KC TO 50 MC, by D.W.R. McKinley and J. C. Swail. National Research Council of Canada. Radio and Electrical Engineering Division. Jul 1951. 9p photos, fold diagr Available from National Research Council of Canada, Ottawa, Canada. $.10. PB 105273

This unit is used to multiply the 100-kilocycle output of a primary quartz crystal standard to 50 megacycles, taking special precautions to suppress unwanted subharmonic sidebands in the output by at least 70 decibels. The output power is approximately 1/2 watt. The unit requires 250 volts d-c, unregulated, at 140 milliamperes. NRCC ERA-203. NRCC 2483.

MODIFICATION OF THE MODEL 5 SYNCHROSCOPE TO LOWER ITS REPETION RATE ON SINE WAVE OPERATION, by William L. Hebenstreit. U. S. Air Force. Electronics Research Division, Cambridge Research Center, Cambridge, Mass. Sep 1951. 6p photos, diagr Microfilm $1.25, Photostat $1.25. PB 105587

The report describes a simple modification of the

Model 5 synchroscope which makes it possible to trigger the sweeps from a sine wave input, at rates from 0.5 to more than 5000 cycles per second, without disturbing any of the normal functions of the synchroscope. AAF ERL E 4085.

RESEARCH ON CRYSTAL DETECTORS OF IONIZING RADIATION. 2D QUARTERLY PROGRESS REPORT, OCT 1, 1949-FEB 1, 1950, UNDER CONTRACT W-36-039-SC-44530: NEW MATERIALS FOR SCINTILLATION COUNTERS AND VARIOUS STUDIES AND APPLICATIONS OF SCINTILLATION COUNTERS, by Robert Hofstadter, J. A. McIntyre, E. Booth and G.S. Brunson. Princeton University. Dept. of Physics. Feb 1950. 41p photos, diagrs, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105554

A. Two new useful organic materials have been discovered which scintillate under impact of ionising particles or radiation. Large crystals of these materials have been grown. A correlation has been found with other physical properties which allows prediction of several other materials which should scintillate. B. A gamma ray spectrometer using the Compton effect and scintillation counters has been developed which allows partial resolution of the Co^{60} gamma rays. C. Studies of the distribution of alpha particle pulses in NaI(T1) show that this phosphor, in a scintillation counter, gives a response proportional to energy. D. Cesium iodide crystals were grown and examined at low and intermediate temperatures with regard to scintillation counting properties. There is a general diminution of counting ability at lower temperatures. Army project 3-99-04-062. Signal Corps project 26-196 B-O.

RESEARCH ON CRYSTAL DETECTORS OF IONIZING RADIATION. 3D QUARTERLY PROGRESS REPORT, FEB 1, 1950-MAY 1, 1950, UNDER CONTRACT W-36-039-SC-44530: STUDIES AND APPLICATIONS OF SCINTILLATION COUNTERS, by Robert Hofstadter, J. A. McIntyre, E. Booth and G. S. Brunson. Princeton University. Dept. of Physics. May 1950. 36p photos, diagrs, graphs Microfilm $2.25, Photostat $5.00. PB 105555

A. The gamma ray spectrometer, reported in the Second Quarterly Progress Report, has been greatly improved so that it now can be used as a reliable tool in studying gamma ray spectra. B. In the course of improving the gamma ray spectrometer, it was found that heretofore unknown resolution of gamma rays by NaI(T1) can be achieved by using a single crystal. This remarkable behavior occurs because it is possible to resolve the full energy of the gamma ray from the Compton recoil electron distribution of energies. Pulses giving the full energy of the gamma ray arise in two ways. C. Studies have been made of the rate of decay of NaI(T1) pulses as a function of temperature. The decay constants and an 'activation energy' have been measured. The results indicate that different mechanisms of the scintillation process occur in the inorganic and organic crystals. D. Alpha particle pulses and beta particle pulses are compared on an energy basis. E. The amount of light emerging from a scintillation in a crystal is shown by model studies to be at least 50 percent of the total light produced in the scintillation. F. Methods were developed showing that NaI(T1) can be well preserved against moisture damage by enclosure in lucite. Army project no. 3-99-04-062. Signal Corps project 26-196B-O.

RESEARCH ON CRYSTAL DETECTORS OF IONIZING RADIATION. FINAL PROGRESS REPORT, JUNE 1, 1949-AUG 31, 1950, UNDER CONTRACT W36-039-SC-44530: ADVANCES IN THE DETECTION OF GAMMA RAYS, by Robert Hofstadter. Princeton University. Dept. of Physics. 1950. 55p photos, diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105556

1. Detectors, Crystal 2. Counters, Electronic 3. Spectrometers, Gamma ray 4. Compton effect 5. Crystals, Cesium iodide 6. Crystals, Sodium iodide 7. Crystals, Lithium iodide 8. Dibenzyl 9. Terphenyl.

Army project 3-99-04-062. Signal Corps project 26-196 B-O. Supplements are articles reprinted from various periodicals. A: Note on the detection of coincidences and short time intervals by Robert Hofstadter and John A. McIntyre. (From Review of Scientific Instruments, vol. 21, no. 1, p. 52-53, Jan 1950). - B: Terphenyl and dibenzyl scintillation counters, by R. Hofstadter, S. H. Liebson and J. O. Elliott (From Physical Review, vol. 78, no. 1, p. 81, Apr 1, 1950). - C: Measurement of gamma-ray energies with two crystals in coincidence, by Robert Hofstadter and John A. McIntyre (From Physical Review, vol. 78, no. 5, p. 619-620, Jun 1, 1950). - D: Measurement of gamma-ray energies with one crystal, by John A. McIntyre and Robert Hofstadter (From Physical Review, vol. 78, no. 5, p. 619-619, Jun 1, 1950).

SOME FUNDAMENTAL ERRORS OF A TRIANGULATION COMPUTER, by E. H. Stock. National Research Council of Canada. Radio and Electrical Engineering Division. Jul 1951. 15p diagr, graphs Available from National Research Council of Canada, Ottawa, Canada. $.15. PB 105412

Some fundamental errors of aircraft position computers employing plane resolution of distances and operated from Shoran or similar radar systems are discussed. The effect of a bulk correction on these errors as applied to the NRC Straight-line Flight Computer is shown for some typical cases. Graphs showing the effect of ray and earth curvatures and heights of the radar stations upon sea-level map distance are included in an appendix. NRCC ERB-244. NRCC 2418.

STUDIES ON THE THRESHOLD SENSITIVITY OF INFRARED DETECTORS USED IN ROCKETS. PART 3: CALIBRATION OF THE APPARATUS AND FURTHER ANALYSIS, by H. Fischer. U. S. Air Materiel Command. Electronics Research Laboratories, Cambridge, Mass. Sep 1951. 25p photo, diagrs, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105514

Further analysis of the problems discussed in a previous report leads to the conclusion that the first objective should be the measurement of the radiation from the boundary layer and optical window. This could be measured during a night flight. A suitable arrangement of spectral filters is suggested. The apparatus is calibrated in units of integrated "effective radiation." It gives the spectral intensity of the incident radiation when suitable spectral filters are applied. AAF ERL E5053 part 3.

TAU-METER FOR RAPID-RESPONSE TEMPERATURE RECORDING SYSTEMS, by L. J. Anderson and H. L. Heibeck. U. S. Navy Electronics Laboratory, San Diego, Calif. Feb 1951. 6p photo, graphs, table Microfilm $1.25, Photostat $1.25. PB 105284

Instrument capable of evaluating temperature recording systems having lag coefficients (tau) ranging from 0.2 to 15 seconds (for larger coefficients, simpler means are suitable). Reprinted from Bulletin of the American Meteorological Society, vol. 32, no. 2, February 1951, pp. 67-71. NELS R 256.

MACHINERY

BOUNDARY-LAYER COOLING OF A FLAT PLATE: A CONTRIBUTION TO A DISCUSSION ON THE COOLING OF GAS TURBINE BLADES, by R. E. Meyer. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Apr 1946. 14p diagrs, graph, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 105336

This report is intended as a basis for a discussion on the possibility of the boundary-layer cooling of turbine blades, and the lines along which research might be undertaken. The investigation of boundary-layer cooling is conveniently divided into two parts; the boundary-layer cooling of a flat plate and the cooling of boundary layers with pressure variations. The first part is the subject of the present paper. German work is briefly considered in Section 2. A new discussion is given in Section 3 and the following sections. With a view to the application to turbine blades, only turbulent boundary layers have been considered. From the energy balance in the boundary layer the mass flow may be determined if the boundary-layer thickness and the velocity distribution in it are known at the end of the plate. A complate theoretical solution has not been achieved even for the case where the maximum temperature of the plate differs little from the temperature of the main stream, and where the Mach number is small, but the problem is reduced to a form in which it can be dealt with by relatively simple experiments. Comparison with experiments on a problem related to that of injection in the direction parallel to the wall (cf. Appendix), and a theory proposed by Schlichting for injection in the direction normal to the wall, suffice for the approximate calculation of the boundary layer (Section 3d), and may serve as a basis for subsequent experiments. By extrapolation of the results to cases of practical interest in connection with gas turbines the order of magnitude of the slit breadth and velocity of injection required can be ascertained (section 3c). In order to facilitate a discussion on the usefulness of further research on boundary-layer cooling, the alternative methods of sector cooling and internal air cooling are mentioned in Section 5.1, and the information available from C.I.O.S. reports on Prof. E. Schmidt's work on liquid cooling is collected in Section 5.2. Cover date is 1951. S. O. Code no. 23-2420. ARC RM 2420.

GERMAN MANUFACTURE OF SEWING MACHINES, GARMENT MAKING MACHINES, CLOTH CUTTING MACHINES, SEWING MACHINE NEEDLES. REPORTED by W. McLucas, R. J. Ashby, H. Bowman, H. Murdoch, L. J. Reid, A. Bellow, G. L. Baurley. British Intelligence Objectives Sub-Committee. May 1946. 92p Microfilm $4.25, Photostat $12.50. PB 105308

1. Sewing machine industry - Germany 2. Sewing machines - Manufacture - Germany 3. Sewing machines - Needles - Manufacture - Germany 4. Cloth - Cutting machines - Manufacture - Germany 5. Machines, Garment making - Manufacture - Germany 6. BIOS FR 769, Item no. 31 & 36. B.I.O.S. Trip no. 2108.

HEAT PUMPS. U. S. Office of Technical Services. Oct 1951. 22p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.50. PB 105425

1. Pumps, Heat 2. Pumps, Heat - Bibliography 3. TAS 94.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N. Y. FIRST QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 JUL 1946-1 OCT 1946. Oct 1946. 25p tables Microfilm $2.00, Photostat $3.75. PB 105515

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Insulating materials - Plastics 4. Tape, Insulation - Corrosion tests 5. Impregnants - Research.

For final report under this contract see PB 98488; for 2d-7th quarterly reports see PB 105516-105521. Appendix contains three test reports: Test report 1: Preliminary corrosion tests on commercial tapes. - Test report 2: Corrosion tests on C-101 tape. - Test report 3: Softening and bonding temperatures of thermoplastic tapes, prepared by Milton Tenzer.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N. Y. SECOND QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 OCT 1946-1 JAN 1947, PREPARED by Milton Tenzer and Edward E. Boyno. Jan 1947. 84p fold graphs, tables Microfilm $3.75, Photostat $11.25. PB 105516

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Tape, Insulation - Tests 4. Impregnants - Research.

For final report see PB 98488; for reports 1,3-7 see PB 105515, 105517-105521.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N. Y. THIRD QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 JAN 1947 - 31 MAR 1947.

by Milton Tenzer and Edward E. Boyno. Apr 1947. 76p photos, fold graphs, tables Microfilm $3.50, Photostat $10.00. PB 105517

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Tape, Insulation - Tests 4. Impregnants - Research.

For final report see PB 98488; for 1st-2nd, 4th-7th see PB 105515-105516, 105518-105521.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N.Y. FIFTH QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 JUL 1947-30 SEP 1947, by Milton Tenzer and Edward E. Boyno. Oct 1947. 65p photos, tables Microfilm $3.00, Photostat $8.75. PB 105519

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Coils - Coatings 4. Impregnants - Research.

For final report see PB 98488; for 1st-4th, 6th-7th reports see PB 105515-105518, 105520-105521.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N.Y. SIXTH QUARTERLY REPORT UNDER CONTRACT NO. W36-039-SC-32370, 1 CCT 1947-31 DEC 1947, by Milton Tenzer and Edward E. Boyno. Jan 1948. 81p drawing, diagrs, tables Microfilm $3.75, Photostat $11.25. PB 105520

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Coils - Coatings 4. Impregnants - Research.

For final report see PB 98488, for reports 1-5,7 see PB 105515-105519, 105521.

INVESTIGATION AND RESEARCH PERTAINING TO THE DEVELOPMENT OF THE PROCESS OF IMPREGNATION TO WITHSTAND ALL TYPES OF ATMOSPHERIC AND CLIMATIC CONDITIONS RELATING TO ROTATING ELECTRIC MACHINERY. CONTINENTAL ELECTRONICS, LTD., BROOKLYN, N.Y. SEVENTH QUARTERLY REPORT UNDER CONTRACT NO. W-36-039-SC-32370, 1 JAN 1948-31 MAR 1948, by Milton Tenzer and Edward E. Boyno. Apr 1948. 84p photos, tables Microfilm $3.75, Photostat $11.25. PB 105521

1. Machines, Rotating - Insulation 2. Insulating varnishes - Research 3. Coils - Coatings 4. Impregnants - Research.

For final report see PB 98488; for 1st-6th see PB 105515-105520.

INVESTIGATION OF THE EFFECT OF FIN SPACING ON THE PERFORMANCE OF LOUVERED PLATE-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Stanford University. Dept. of Mechanical Engineering, Stanford, Calif. Dec 1948. 39p graphs, tables Microfilm $2.25, Photostat $5.00. PB 105314

This report contains the results of basic heat transfer and flow friction tests of three fin-spacing variations of louvered plate-fin type high rating heat exchanger surfaces. All three surfaces have the same plate spacing and louver length. The heat transfer and flow friction characteristics, respectively, are given in both tabular and graphical form using the dimensionless correlations, $(h/Gc_p)\,Pr^{2/3}$ and f versus Re_f. Also included are the heat transfer - friction power characteristics evaluated at certain standard gas properties, h_{std} versus E_{std}. The test results indicate that the heat transfer characteristics can be well correlated by use of a Reynolds' number based on flow passage hydraulic radius, but that the friction factors correlate on such a basis only at $Re < 1000$. A discussion of the reasons for this behavior is included. Contract N6-onr-251, Task order VI (NR-035-104). First supplement to Report no. 2. SU ME TR 3.

RECORD OF CONVERSATION WITH DR. RICHARD KIEFER OF METALLWERK PLANSEE IN REUTTE, TYROL, 3D MARCH 1946, by C. J. Trapp. British Intelligence Objectives Sub-Committee. Mar 1946. 3f Microfilm $1.25, Enlargement Print $1.50. PB 105461

1. Dies, Diamond - Germany 2. Grinding wheels, Diamond impregnated - Germany 3. Metallwerk Plansee, G.m.b.H., Reutte, Austria 4. Micro BIOS FD 3027/49, Frames 1-2.

Abstract included. Abstract available as PB 105461s. 1p. Microfilm $1.25, Photostat $1.25. For further information on diamond dyes see BIOS FR 1448 (PB 86151).

MODIFICATIONS OF DIRECTION OF MOVEMENT PREFERENCE WITH INDEPENDENT VARIATION OF TWO STIMULUS DIMENSIONS, by Edward A. Bilodeau. U. S. Air Force. Human Resources Research Center, Lackland Air Force Base, San Antonio, Texas. Jun 1951. 10p drawing, graphs, table Microfilm $1.25, Photostat $1.25. PB 105247

1. Psychomotor tests 2. Motion and time study 3. Machinery - Design - Anatomical factors 4. AAF HRRC RB 51-12.

NOTES ON FURNACE DESIGN AND THE MODIFICATION OF CAST IRON PHYSICAL PROPERTIES. REPORT ON INTERROGATION OF PROF. PIWOWARSKY, by Renshaw. Ford Motor Co., Ltd., Dagenham, Essex, England. Nov 1947. 3f Microfilm $1.25, Enlargement Print $1.50. PB 105435

1. Aix-la-Chapelle. Technische Hochschule 2. Furnaces, Cupola - Germany 3. Cast iron - Physical properties - Germany 4. Micro BIOS FD 3031/49, Frames 1-2.

Abstract included. Abstract available as PB 105435s. 1p. Microfilm $1.25, Photostat $1.25.

TUNNEL CONSTRUCTION BY PERIPHERAL SAWING AT THE FORT RANDALL RESERVIOR, PICKSTOWN, S. DAK., by Walter E. Lewis. U. S. Bureau of Mines. Jul 1951. 55p photos, drawings, diagrs, graph, tables Microfilm $2.75, Photostat $7.50. Limited supply available free from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. PB 105342

TECHNICAL REPORTS News letter

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OFFICE OF TECHNICAL SERVICES
WASHINGTON 25, D. C.

No. 31, JANUARY, 1952

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1. Tunneling 2. Excavating machinery 3. Ft. Randal Reservior, Pickstown, S. Dak. 4. BM IC 7610.

VON DER EINZELFERTIGUNG ZUR MASSENPRODUKTION (FROM INDIVIDUAL TO MASS PRODUCTION) by Dipl.-Eng. Seebauer. Germany. Reichsministerium für Rüstungsund Kriegsproduktion. Produktions Amt. Jul 1944. 465f photos, drawings, diagrs (Text in German) Microfilm $9.00, Enlargement Print $61.25. PB 105405

1. Mass production - Germany 2. Industrial production - Germany 3. Micro BIOS FD 279/51, Frames 3-475.

English abstract available as PB 105405s. 2p. Microfilm $1.25, Photostat $1.25. Referred to in BIOS FR 641, p. 230. Contents: Einfuhrung (Introduction) by Seebauer. - Grundlagen der serien-und massenfabrikation (Principles of series and mass production) by H. Stein. - Automasierte arbeitsmaschinen (Mechanization in cutting and machining materials) by R. Heidenreich. (English translations of these two articles are in BIOS FR 641, appendix F). - Auf dem wege zur vollmechanisierung in der fensterglasherstellung (Towards full mechanization into the manufacture of window glass) by Ochs and R. Klattenhof. - Massenfertigung und fliessarbeit nebst ihren Grundlagen in der lederindustrie (Mass production and production line methods and their principles in the leather industry) by Dr. C. Heyl. - Hochautomatik in der papierverarbeitung (Maximum mechanization in the paper industry) by Bugner. - Holzbearbeitungsmaschinen in der grossreihen und massfertigung (Woodworking machines in large-scale series and mass production) by K. Tschernjakow. - Glasshütte automatisiert (Mechanization in the glass factory) by Hellmut Berger. - Erfahrungsschatzkästlein der spanlesen formung (Valuable experiences in non-cutting shaping) by E. Göhre. - Fliessfertigung in der nähenden industrie (Production line methods in the sewing industry) by Heimann. - Schwartzblecht statt weissblech in einer modernen desenlinie (Black plate instead of tinplate in the production of containers) by H. Munte. - Unser täglich bret auf dem band (Line production for our daily bread) by Friedrich Pohl. - Formen und fördern in der holzboarbeitenden industrie (Cutting technique, feed, and assembly in the woodworking industry) by Oskar Bormann. - Alle 50 sekunden eine uniformhose (A pair of uniform trousers in 50 seconds) by Wilhelm Weber. - Elastisches vierfachband für heeresschnürschuhschäfte (Flexible quadruple conveyor in the manufacture of army laced boot uppers) by Wilhelm Dilli. - Teil-und vollfleissfertigungen in der technischen keramik (Partial and full band conveyor in technical ceramics) by E. H. Friedrich Schied. - Nutzbarmachung des fliessprinzips für die spiegelglasfabrikation (Utilization of the band conveyor principle in mirror manufacture) by Rudolf Simon. - Umstellung einer friedensfabrikation auf höchstleistung für die Wehrmacht (Change-over in chocolate production from peace-time methods to large-scale production for the German armed forces) by E. Alpers. - Vom kunsthandwerk zur massenherstellung (From handicraft to mass production (in leather bag manufacture)), by Heinrich Krumm. - Reaktivierung von heimarbeit (Revival of home work (in military clothing industry)) by Carl Hermann. - Der leitbetrieb (Utilizing the rural population (for home work on army clothes)) by Heinrich Becker. - Holzschuhselenfertigung früher und heute (Wooden sale manufacture in earlier times and today) by G. Bogner. - Umstellungeiner näherei auf elektromotorenwickelei (Changing a sewing establishment to work on electric motors) by E. Pflaume and Luise Bening.

MEDICAL RESEARCH AND PRACTICE

EFFECTS OF EXTREME HEAT ON MAN, II: ANALYSIS OF TEMPERATURE CHANGES CAUSED BY DIFFERENT KINDS OF HEAT APPLICATION TO THE SKIN, by Konrad Buettner. U.S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Nov 1951. 10p diagrs, graphs Microfilm $1.25, Photostat $1.25. PB 105530

The temperature change of skin, suddenly heated or colled, is subject to the physical laws of heat conduction and heat transfer. Calculations reveal the temperature increase upon application of non-pentrating constant heat, penetrating radiant heat, Newtonian and contact heat, and heating through a protective layer. The temperature fall after heat application can also be predicted. Causation of burns is subject to the law of rate processes and can be predicted from the temperature curves. For reports nos. 3 and 4 see PB 105531 and PB 105532. AAF SAM Proj. 21-26-022, Report no. 2.

EFFECTS OF EXTREME HEAT ON MAN, III: SURFACE TEMPERATURE, PAIN, AND HEAT CONDUCTIVITY OF LIVING SKIN IN EXPERIMENTS WITH RADIANT HEAT, by Konrad Buettner. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Nov 1951. 9p graphs, tables Microfilm $1.25, Photostat $1.25. PB 105531

Irradiation of human skin with strong infrared heat produced pain within 2 to 60 seconds, depending on radiation intensity and initial skin temperature. Peripheral blood flow and wetness of the skin do not influence temperature or pre-pain time for higher intensities. Pain threshold temperature is 44.8°C. and the pain receiver depth 0.1 mm. Heat conductivity of the upper skin can be derived from data given. Pre-cooling the skin seems to offer effective protection against over-heating. For reports nos. 2 and 4, see PB 105530 and PB 105532. AAF SAM Proj. 21-26-002, Report 3.

EFFECTS CF EXTREME HEAT ON MAN, IV: MECHANISM OF HEAT TRANSFER IN AN OPEN GASOLINE FIRE, by Konrad Buettner, Everett O. Richey. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Jul 1951. 5p graphs Microfilm $1.25, Photostat $1.25. PB 105532

The heat transfer to a body suspended in an open gasoline fire was measured using calorimeters with black and with highly polished metallic surfaces. In all but one fire at least 90 percent of the heat transfer occurred by radiation. This radiation was reduced markedly by a highly polished metallic surface until the surface was blackened by soot. The blackening occurred gradually during the first 50 seconds after entry into the flame. For reports no. 2 and 3, see PB 105530 and PB 105531. AAF SAM Proj. 21-26-002, Report no. 4.

ESTIMATION OF RADIOACTIVE STRONTIUM AND OTHER FISSION PRODUCTS IN URINE AND WATER, by C. A. Mawson and I. Fischer. National Research

Council of Canada. Atomic Energy Project. n.d. 21p graph, tables Available from National Research Council of Canada, Ottawa, Canada. $.20. PB 105053

1. Radioactive substances - Toxicity - Canada 2. Strontium - Physiological effects - Canada 3. Urine - Strontium content - Canada 4. Water - Strontium content - Canada 5. Fission products - Physical properties - Canada 6. Atomic power - Research - Canada 7. NRCC AEP CRM-455. 8. NRCC 2392.

INFLUENCE OF POLYCYTHEMIA PRODUCED AT HIGH ALTITUDE ON RESISTANCE TO INFECTION, II: EFFECT OF PERIOD OF ADAPTATION AND PERIOD OF RECOVERY ON RESISTANCE, BY L. JOE BERRY AND ROLAND B. MITCHELL, WITH THE TECHNICAL ASSISTANCE OF ELENORE SCHEWE, JANE ROGERS, AND ELIZABETH TRAVAGLINI. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Oct 1951. 10p diagrs, graphs, tables Microfilm $1.25, Photostat $1.25. PB 105468

1. Altitude, High - Physiological effects 2. Polycythemia, Induced 3. Mice - Polycythemia, Induced 4. Salmonella typhimurium 5. Bryn Mawr College. Dept. of Biology, Bryn Mawr, Pa. 6. AAF SAM Proj. 21-35-005, Report no. 2.

Contract number AF 33(038)-17842.

INFLUENCE OF POLYCYTHEMIA PRODUCED AT HIGH ALTITUDE ON RESISTANCE TO INFECTION, III: THE RESPONSE TO CLOSTRIDIUM BOTULINUM TOXIN, BY L. JOE BERRY, ROLAND B. MITCHELL, WITH TECHNICAL ASSISTANCE OF ELENORE SCHEWE, JANE ROGERS AND ELIZABETH TRAVAGLINI. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Oct 1951. 7p graphs, tables Microfilm $1.25, Photostat $1.25. PB 105534

CF-1 mice were adapted to an altitude of 15,000 to 20,000 feet for two weeks. One group was given two weeks of recovery and another group one day of recovery under normal atmospheric pressures. Mice with the longer recovery period showed the same survival as control mice following injection of Clostridium botulinum toxin. Mice with one day of recovery had a transitory period of greater resistance 12 to 28 hours after injection of the toxin than did control mice. Animals made anemic by standardized hemorrhages were more resistant to toxin than control mice throughout the post-injection period. Contract number AF 33(038)-17842. AAF SAM Proj. 21-35-005, Report no. 3.

INTELLIGIBILITY OF SPEECH AS A FUNCTION OF THE CONTEXT OF THE TEST MATERIALS, by George A. Miller, George A. Heise, William Lichten. Harvard University. Psycho-Acoustic Laboratory. Sep 1950. 21p graphs, table Microfilm $2.00, Photostat $3.75. PB 105285

Articulation tests showed the effects of limiting the number of alternative test items upon the intelligibility of speech in noise. The number of alternative test items was limited by providing 3 kinds of context: (1) restricting the size of the test vocabulary, (2) using the test words in sentences, and (3) repeating the test words. Differences among test materials in regard to their intelligibility are attributable principally to the fact that some materials require more information than others for their correction recognition. The relative amount of information necessary for a given type of item is a function of the number of alternative possibilities. As the number of alternatives increases the amount of information necessary per item also increases; the noise level must be reduced to permit more accurate discrimination. The context of repetition, however, does not improve intelligibility greatly. More improvement is possible by standardizing procedures and vocabulary than by automatic repetition of every message. Contract N5 ori-76, Project order II, NR147-201. PNR 74.

JAW MOTIONS RELATIVE TO THE SKULL AND THEIR INFLUENCE ON HEARING BY BONE CONDUCTION, by Ernst K. Franke, Henning E. von Gierke, Wolf W. von Wittern. U. S. Air Materiel Command. Engineering Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. May 1951. 11p graphs Microfilm $1.75, Photostat $2.50. PB 105472

Opening and closing the mouth increases the sound pressure produced by bone conduction in the closed auditory canal by as much as six to ten decibels in the frequency range between 40 cps and 700 cps. The difference is explained by vibrations of the lower jaw relative to the skull. The resonance curve of this motion was measured and used to calculate the influence of the lower jaw motion on the sound level in the closed auditory canal. The results show that the measured frequency response of the difference in sound pressure open mouth vs. closed mouth, may be explained entirely by vibrations of the lower jaw. Aero Medical Laboratory E. O. no. R-695-63. AAF TR 6466.

MECHANICAL IMPEDANCE MEASUREMENTS OF THE HUMAN BODY SURFACE, by Ernst K. Franke. U. S. Air Force. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Apr 1951. 31p photos, diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105189

Measurements were made of the mechanical impedance of the human body surfaces. The measurements were carried out at different places of the body surface in the frequency range from 15 to 1,500 cps. The data were obtained by pressing the free end of a vibrating piston (area 2, 5.3 and 11.7 cm^2 respectively) against the body surface. The displacement of the piston and the vibratory force exerted on the body surface were measured. The derivation of the impedance from the measured values is explained theoretically. The measuring device is described. The experimental results show for the body surface the impedance as a function of the frequency and of the measured area. From these data the absorption coefficient of the body surface fibratory energy was calculated. It was possible to establish a simple harmonic oscillator as a model for the mechanical behavior of the body surface. The result of the measurements as well as those of H. E. von Gierke can be explained theoretically by considering the underlying body tissues as a viscous-elastic fluid as pointed out by H. L. Oestreicher. The nonlinear behavior of the muscular elasticity as a function of the pressure of application of the piston was investigated. This knowledge is valuable to obtain the response of the body surface to vibrations of large amplitude. The results of these measurements are compared

with those obtained by other methods and published by E. Simonson. AAF TR 6469.

MEMORANDUM ON CARBON MONOXIDE POISONING. Gt. Brit. Ministry of Labour and National Service. Factory Dept. 1951. 46p photos, drawings, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.50. PB 105156

1. Carbon monoxide - Toxicity - Gt. Brit. Form 827.

OPHTHALMOLOGICAL STUDY OF VISUAL ACUITY UNDER DIM ILLUMINATION, by Cornelia Pratt and Forrest L. Dimmick. U. S. Navy. Medical Research Laboratory, Naval Submarine Base, New London, Conn. Jun 1951. 13p diagrs, graph, tables Microfilm $1.75, Photostat $2.50. PB 105239

An experiment investigating the relationship between refractive error and loss of acuity under low illumination was performed by Dr. Franklyn D. Burger. Snellen acuity scores at 24 light levels from 2 footcandles down to .0027 footcandles were obtained from each eye of 558 subjects. The subjects were also refracted for best acuity. The highest acuity scores throughout were made by +.75 diopter hyperopes. Absolute differences in acuity due to refractive error diminish with lowered illumination to a point where they have little significance. The results indicate, however, that for non-astigmatic subjects with refractive errors between +1.00 and -.50 diopters, the proportionate change in acuity with illumination is not influenced by refractive error. Bu Med Project NM 003 041. 04. 04. MRL Report no. 173, vol. 10, 1951, p. 42-55.

PARAMETERS OF SCOTOPIC SENSITIVITY: (1) THE EFFECT OF SIZE, by Jo Ann Smith and Forrest L. Dimmick. U. S. Navy. Medical Research Laboratory, Naval Submarine Base, New London, Conn. Jun 1951. 19p photo, graphs, tables Microfilm $1.75, Photostat $2.50. PB 105240

The scotopic sensitivity of the dark adapted eye was determined for stimuli of variable size and constant brightness, as the first part of a fuller investigation of the parameters of night vision. The visual field was explored at points having various degrees of eccentricity in each of four quadrants, all chosen to yield a sample of total sensitivity. Using the 50% limens in terms of the angular subtense of the stimuli as the measure of sensitivity, a complete picture of the sensitivity gradients of the eye was found throughout the visual field. Further studies will deal with the other parameters of sensitivity and their interrelationships. Bu Med Project NM 003 041.09.03. MRL Report no. 174, vol. 10, 1951, p. 56-75.

PROGRESS REPORT ON RESEARCH ON DENTAL MATERIALS, by W. T. Sweeney. Michigan. University. School of Dentistry. Mar 1949. 9p graphs Microfilm $1.25, Photostat $1.25. PB 105029

1. Gypsum - Properties 2. Resins - Properties 3. Prostheses, Dental - Materials.

Contract N6-onr-232, Task order VIII, NR 180-360.

SOME PHASES OF PERSPIRATION: LITERATURE SURVEY, PREPARED by Francis D. Horigan and Cary R. Sage. U. S. Office of the Quartermaster General. Military Planning Division. Research and Development Laboratories. Technical Library. Jan 1951. 39p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $1.00. PB 105478

1. Sweat - Biochemistry - Bibliography 2. Sweat - Vitamin content - Bibliography 3. Sweat - Effects of environment - Bibliography 4. Sweat - Effects on leather - Bibliography 5. Sweat - Effects on metals and finishes - Bibliography 6. Deodorants - Bibliography 7. QMC TL BS 17.

SOME USES OF THE CONTACT LENS IN RESEARCH, by Dorothy Ann McClelland and Lorrin A. Riggs. Brown University, Providence, R. I. Feb 1951. 11p drawing, graphs Microfilm $1.75, Photostat $2.50. PB 105550

Nonoptically fitted plastic contact lenses, mounted with Ag electrodes making contact with the cornea of the eye, were used for studying the electrical activity of the human retina. Photographic recordings of this activity have been used to (1) study the processes of light and dark adaptation, (2) study the electrical response to stimulation of the eye by colored lights, and (3) compare the subject's observations with the electrical recordings. Results indicate that the electrical response is primarily scotopic in origin and that dark adaptation takes place at the retinal level. Contract N7onr-358, Task order II, Project no. NR-141-359. Research sponsored by National Research Council, American Philosophical Society, and Office of Naval Research.

STATEMENT FILED BY AUSTENAL LABORATORIES, INC., WITH THE UNITED STATES DEPARTMENT OF COMMERCE IN ACCORDANCE WITH THE PROVISIONS OF SECTION VII, SUBPARAGRAPH (A) OF FINAL JUDGEMENT IN THE MATTER OF UNITED STATES VS. AUSTENAL LABORATORIES, INC., UNITED STATES DISTRICT COURT, SOUTHERN DISTRICT OF NEW YORK, CIVIL NO. 50-496, ENTERED JUNE 29, 1951. Austenal Laboratories, Inc., New York. Jun 1951. 11p diagr Microfilm $1.75, Photostat $2.50. PB 105745

1. Vitallium (Trade name) 2. Cobalt chromium alloys 3. Prostheses, Dental - Materials.

METALS AND METAL PRODUCTS

AL-ZN-MG-CU LEGIERUNGEN (ALUMINUM-ZINC-MAGNESIUM-COPPER ALLOYS), by H. Winter. 1947. 35f graphs, table (Text in German) Microfilm $2.25, Enlargement Print $6.25. PB 105492

1. Aluminum - Magnesium-zinc-copper-alloys - Germany 2. Micro FD 784/50, Frames 1-34.

English abstract included. Abstract available as PB 105492s. 1p. Microfilm $1.25, Photostat $1.25. This is section XI of a work of unknown title. Information from this in FIAT Review of German Science 1939-1946, Non-ferrous metallurgy, pt. I, p. 117-126.

ALLOY STEEL CONSERVATION - NATIONAL EMERGENCY AND BORON STEELS. U. S. Office of Technical Services. Sep 1951. 6p tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.10.
PB 104922

1. Steel - Conservation 2. Steel alloys - Conservation 3. Steel, Boron - Conservation 4. OTS IR 7052.

ALLOYS FOR HIGH-TEMPERATURE SERVICE. QUARTERLY PROGRESS REPORT, JUNE-AUG 1949 UNDER CONTRACT N5ORI-111, TASK ORDER I, PROJECT NR 031-003, TRANSMITTED by Howard C. Cross. Battelle Memorial Institute, Columbus, Ohio. Sep 1949. 17p photos, tables (1 fold) Microfilm $1.75, Photostat $2.50. PB 105105

In the program to improve the room-temperature shock resistance of chromium-base alloys, 35 heats were prepared to study the effects of several variables. These are: type of crucible, type of chromium charged, pouring and mold temperatures, deoxidation by aluminum or zirconium silicide, carbon and nitrogen contents, and heat treatment. The bend-test results obtained to date on chromium-base alloys indicate that, the finer the grain size, the greater is the maximum bending stress (in tension). The investment casting of the 58Cr-15Fe-25Mo-2Ti type alloy is progressing. Tests made with molds consisting of beryllia refractory and acid or basic binders produced castings with smoother surfaces than any obtained thus far. The investigation of the effects of nitrogen, iron, and nickel on the alpha-beta transformation and gamma precipitation in cobalt-chromium-base alloys was completed. Ternary cobalt-chromium-base alloys containing tungsten or molybdenum were prepared and homogenized. These will be used in evaluating the effects of tungsten and molybdenum on the reactions in cobalt-chromium alloys. Creep-rupture tests on cobalt-chromium binary alloys were continuing. Pages numbered 1384-1394. BMI G-1009-9.

ALLOYS FOR HIGH-TEMPERATURE SERVICE. BATTELLE MEMORIAL INSTITUTE, COLUMBUS, OHIO. QUARTERLY REPORT, SEPT-NOV 1949 UNDER CONTRACT NO. N5ORI-111, TASK ORDER I, PROJECT NR031,003, TRANSMITTED by Howard C. Cross. Dec 1949. 39p diagrs, graphs (2 fold) tables (part fold) Microfilm $2.25, Photostat $5.00.
PB 105106

In the investigation of chromium-base alloys, the effects of variations in melting and casting practices, chemical composition, and heat treatment on room-temperature shock resistance are being studied. Sixty heats have been prepared and tested in bending. The load-deflection curves for all of the alloys tested were straight lines and showed no evidence of plastic deformation. Two factors, grain size and oxygen content, appeared to be related to the maximum bending stress (in tension). The maximum bending stress tended to vary inversely as the logarithm of the grain size. For a given grain size, alloys containing more than 0.06 per cent oxygen generally broke at higher maximum bending stresses than those with lower oxygen contents. The alpha-beta transformation in the cobalt-chromium-tungsten and cobalt-chromium-molybdenum alloys was blocked in. The transformation in these alloys is now being accurately determined. Binary cobalt-chromium alloys are being tested in creep rupture. Thirty-nine cobalt-chromium-nitrogen alloys were cast for the study of the effect of nitrogen and microstructure on the rupture properties of cobalt-chromium alloys. Pages numbered 1395-1422. BMI G-1009-9.

ANALYSIS AND SAMPLING OF LIQUID STEEL FOR HYDROGEN, by D. J. Carney, J. Chipman and N. J. Grant. Massachusetts Institute of Technology. Dept. of Metallurgy. Jul 1949. 96p photos, drawings, graphs, tables Microfilm $4.25, Photostat $12.50.
PB 105103

1. Steel - Analysis 2. Steel - Hydrogen content 3. Furnaces - Design 4. Steel - Testing equipment. Contract N5 ori-78, T. O. 16, NR-031-186.

BASIC CHEMISTRY OF GALLIUM: STABILITY OF GALLIUM HALIDE COMPLEX IONS IN AQUEOUS SOLUTIONS. CHICAGO. UNIVERSITY. DEPT. OF CHEMISTRY. FINAL REPORT, AUGUST 1, 1947 - JUNE 30, 1949, BY HENRY TAUBE AND ARCHIE S. WILSON UNDER CONTRACT NO. N6-ORI-20, TASK ORDER NO. XVI. 1949. 16p tables Microfilm $1.75, Photostat $2.50. PB 105062

1. Gallium - Chemical properties 2. Gallium - Ions - Stability.

This report covers work performed by Mr. Archie S. Wilson in the period from November 2, 1948 to June 30, 1949.

BERICHT BETR. VERFAHREN VON RUDOLF JOHN, ANTIMON-VERHÜTTUNG, VON R. H. LEY UND DR. H. J. KAMBEITZ (REPORT ON VISIT TO RUDOLF JAHN, ANTIMONY WORKS), by A. Roesner. Metallgesellschaft A. G., Frankfurt am Main, Ger. Feb 1939. 9f drawing (Text in German) Microfilm $1.25, Enlargement Print $2.50. PB 105462

1. Antimony - Refining - Germany 2. Arsenic - Metallurgy - Germany 3. Mercury - Purification - Germany 4. Jahn, Rudolf, G.m.b.H., Vienna 5. GP 102293, 11 Jan 1926 (Klasse 40a) 6. Micro BIOS HEC 12121 7. Micro BIOS FD 4926/47, Frames 1-11.

Includes German patent no. 102293.

BRIEF REPORTS ON ITEMS OF METALLURGICAL RESEARCH, by Heinz Borchers. 1947. 19f (Text in German) Microfilm $1.75, Enlargement Print $3.75.
PB 105452

1. Aluminum - Production - Germany 2. Scrap metal, Aluminum - Aluminum recovery - Germany 3. Iron-carbon alloys - Hardening - Germany 4. Micro BIOS FD 773/50, Frames 1-47.

English abstract included. Abstract available as PB 105452s. 2p. Microfilm $1.25, Photostat $1.25. Reports written in cooperation with Dr. E. Hanke, Dr. F. Letsas, Dr. K. Frotzler, Dr. H. J. Otto, Dr. K. Kallhardt. First report is summarized in Fiat Review of German Science 1939-1946, Non-ferrous metallurgy, pt. I, p. 10-11.

CHARTS FOR TEMPERATURE COMPUTATIONS, by R. Shaw. Massachusetts Institute of Technology. Servomechanisms Laboratory. Mar 1949. 3p draw-

J. Metals 1950 1951

ings Microfilm $1.25, Photostat $1.25. PB 105071

1. Project Whirlwind 2. Ohm's law 3. Tungsten - Temperature - Measurements 4. Tungsten - Electron emission 5. Pyrometers, Optical 6. MIT SL M-824.

6345. Memorandum M-824. Project Whirlwind. Drawings attached: SA-33799, SA-38664-G. The chart was constructed from data tabulated in Espe and Knoll, Werkstoffkunde der Hochvakuumtechnik, page 20. Reference 1 RS 121.

DAS VERHALTEN DES EISENS BEIM SEIGERN VON LEGIERUNGEN DES ALUMINIUMS (BEHAVIOR OF IRON IN THE MELTING OF ALUMINUM ALLOYS), by August Buckeley. Jan 1947. 22f (Text in German) Microfilm $2.00, Enlargement Print $5.00. PB 105490

1. Aluminum - Purification - Germany 2. Aluminum alloys - Purification - Germany 3. Aluminum alloys - Iron content - Germany 4. Micro BIOS FD 776/50, Frames 1-20.

English abstract included. Abstract available as PB 105490s. 1p. Microfilm $1.25, Photostat $1.25. In FIAT Review of German Science 1939-1946, Nonferrous metallurgy, Pt. I., p. 26-27.

DELAYED YIELD IN ANNEALED STEELS OF VERY LOW CARBON AND NITROGEN CONTENT, BY D. S. WOCD AND D. S. CLARK. CALIFORNIA INSTITUTE OF TECHNOLOGY. DYNAMIC PROPERTIES LABORATORY. SECOND TECHNICAL REPORT UNDER CONTRACT N6 ONR-24418, PROJECT NR 031-285. Aug 1950. 64p photos, graphs, tables Microfilm $3.00, Photostat $8.75. PB 105380

Rapid-load tensile tests were performed on 0.12% C-steel samples which were annealed, wet-H treated to remove the static upper-yield point, wet-H treated and recarburized, or wet-H treated and renitrided. All materials exhibited delayed yielding caused by stress and temperature factors; the influence of concentration on delayed yielding was not additive. The stress level of the delay time-vs. -stress values was lowered by reducing C and N concentrations; values for recarburized and renitrided specimens were similar to those for annealed steels. Sensitivity of the upper-yield point to the duration of loading was postulated from results of rapid-load and static tests. A yielding mechanism free of C and N effects was postulated at further concentration reduction.

EFFECT OF ALLOYING ELEMENTS ON THE ELECTRICAL RESISTIVITY OF ALUMINUM ALLOYS, BY A. T. ROBINSON AND J. E. DORN. CALIFORNIA. UNIVERSITY. DEPT. OF ENGINEERING, BERKELEY, CALIF. TENTH TECHNICAL REPORT UNDER CONTRACT N7-ONR-295, TASK ORDER II, NR 031-048. Aug 1950. 22p graphs, tables Microfilm $2.00, Photostat $3.75. PB 105375

Resistivities of Cu-, Zn-, Ge-, Ag-, Cd-, and Mg-Al alloys were determined as a function of the atom % of the alloying element; a linear proportionality was obtained. The Norbury rule applied to the resistivity gave an apparent Al valence of 2.5, indicating partial ionization in the metallic state. Series no. 22, issue 9.

EFFECT OF CARBON CONTENT ON THE NOTCHED BAR IMPACT PROPERTIES OF QUENCHED AND TEMPERED STEEL, by M. Baeyertz, W. F. Craig, Jr., and J. P. Sheehan. Armour Research Foundation, Chicago, Ill. Sep 1950. 108p graphs, tables Microfilm $4.50, Photostat $13.75. PB 105378

The notched-bar impact properties of steel series nos. 4300, 2300, and 8600 in the tempered martensitic condition were investigated; each had a C content of 0.20 to 0.80%. The 4300 series was tested through a tempering range of 400° to 1200°F for 1 hr.; the 8600 and 2300 were limited to tempering treatment at 800°, 1000°, and 1200°F. The hardness at the maximum A-brittleness appears to depend upon the as-quenched hardness of the martensite, and represents a particular stage in the tempering reaction exclusive of the decomposition of retained austenite. The 4300 series showed a minimum in transition temperatures in the range of 0.30 to 0.40% C on the basis of equal hardness. The hardness of the maximum A-brittleness in the 4300 series depends upon the C content of the heats. Good low-temperature properties are possible from the proper selection of martensite in the hardness range of 40 to 50 Rockwell C. The 80% maximum attainable energy does not depend entirely upon the hardness of the tempered martensite; a rough equivalence is obtained for steels of 0.30 to 0.40%C. At low hardness levels, the 0.2% C steels tend to deviate from the trend of the 0.40% C steels; C levels above 0.40% lowered the maximum attainable energy at all tempering treatments. The maximum attainable energy in Charpy tests of laboratory steels depends upon the as-tempered hardness, the C content of the steel and whether the tempering temperature exceeds that required to bring about the maximum of A-brittleness. These data are applicable to tempered martensite with the exceptions of individual heat brittleness, temper brittleness, and B-brittleness. Contract N6 onr 274, T. O. I, Project NR 031-115. Continuation of Report 22. ARF Project 90-446B. ARF 28.

EFFECT OF MOLYBDENUM ON THE RATE OF GROWTH AND INTERLAMELLAR SPACING OF PEARLITE, by R. W. Parcel and R. F. Mehl. Carnegie Institute of Technology. Metals Research Laboratory. Jan 1949. 10p graphs Microfilm $1.25, Photostat $1.25. PB 105077

1. Pearlite - Effect of molybdenum 2. Pearlite - Rate of growth 3. Molybdenum - Effect on pearlite 4. Steel, Molybdenum - Pearlite formation.

Contract N6 ori-47/IV, Project NR 031-184.

EFFECTS OF SOME SOLUTION TREATMENTS FOLLOWED BY AN AGING TREATMENT ON THE LIFE OF SMALL CAST GAS-TURBINE BLADES OF A COBALT-CHROMIUM-BASE ALLOY. II: EFFECT OF SELECTED COMBINATIONS OF SOAKING TIME, TEMPERATURE, AND COOLING RATE, by C. A. Hoffman and C. F. Robards. U. S. National Advisory Committee for Aeronautics. Oct 1951. 19p photos, diagrs, graphs, tables Microfilm $1.75, Photostat $2.50. PB 105420

An investigation was conducted to determine the effects of a number of solution and aging treatments on the life of small cast gas-turbine blades of Hayes Stellite alloy 21 (a cobalt-chromium-base alloy). Solution Treating at 2250°F followed by slow furnace

cooling and subsequent aging was found to improve the mean life and the initial failure time of the blades. This improvement was confirmed by statistical analysis. Metallographic examination revealed the presence of a lamellar structure in the improved blades. Other treatments investigated did not improve blade life. The blades were operated at 1500° F and 20,000 pounds per square inch at the blade mid-span. Samples of 20 and 22 blades were used. NACA TN 2513.

ELECTRICAL AND OPTICAL PROPERTIES OF RUTILE SINGLE CRYSTALS, by D. C. Cronemeyer. Massachusetts Institute of Technology. Laboratory for Insulation Research. Aug 1951. 67p diagrs, graphs, tables Microfilm $3.00, Photostat $8.75. PB 105232

Clear, synthetic rutile (TiO_2) single crystals have been investigated by electrical and optical methods. It seems possible to correlate the high temperature conductivity (E_G = 3.05 ev) with the threshold of optical absorption at low temperatures (3.03 ev) and with the maximum of the photoconductivity (3.03 - 3.06 ev). This evidence indicates an energy gap ca. 3.05 ev for rutile as an insulator. Semiconducting rutile, prepared by hydrogen reduction at temperatures $\leq 800^{\circ}C$, shows a blue color arising from an optical absorption maximum at ca. 1.7 μ (0.73 ev). Conductivity-temperature plots for slightly reduced specimens indicate an optical activation energy of 0.68 ev. A theoretical calculation for the ionization of the first electron from an oxygen vacancy indicates 0.74 ev as the expected value, in good agreement with the experimental results. At room temperature the mobility of electrons in slightly reduced single crystals is ca. 10^{-4} m^2/v-sec. Strongly reduced rutile is opaque; a comparison of electron concentrations calculated from weight loss and Hall coefficient data shows that for samples containing about $10^{26}/m^3$ all of the electrons contribute to conduction at room temperature. O.N.R. Contract N5-ori-07801. MIT LIR TR 46.

EVALUATION OF THE HARDENING POWER OF QUENCHING MEDIA FOR STEEL, by Earl J. Eckel, Ross M. Mayfield, Glenn W. Wensch and Frank A. Rough. Illinois. Engineering Experiment Station, Urbana, Ill. Jun 1951. 131p photos, drawings, graphs, tables Available from Engineering Experiment Station, University of Illinois, Urbana, Ill. $1.50. PB 105163

1. Steel - Quenching media - Hardening effect 2. Steel - Hardening 3. ILU EES B 389.

Contents: Part I: Water, 9 percent brine, straight mineral oil, compounded oil, and air under agitated quenching conditions, by Earl J. Eckel. - Part II: Brines (0 to 25 percent sodium chloride) under agitated quenching conditions, by Earl J. Eckel and Ross M. Mayfield. - Part III: High temperature quenching oil and ethylene glycol under agitated conditions, by Earl J. Eckel and Glen W. Wensch. - Part IV: Water, brines and oils under still quenching conditions, by Earl J. Eckel and Frank A. Rough.

EVALUATION OF THE PROPERTIES OF TITANIUM AND TITANIUM-BASE ALLOY SHEET, by A. J. McCulloch, W. A. Reinsch, T. J. Virnelson, W. A. Pitman. United Aircraft Corp. Chance Vought Aircraft Div., Dallas, Texas. Feb 1951. 102p photos, drawings, graphs, tables Microfilm $4.50, Photostat $13.75. PB 105190

A preliminary investigation of the characteristics of available commercially pure and alloyed titanium sheet led to the selection for more extensive investigation of the manganese alloy of titanium produced in sheet form by Rem-Cru Titanium, Incorporated, and designated as RC-130-A. The investigation of this material showed that it possesses attractive mechanical properties but that its use in airframe fabrication is presently restricted by non-uniformity of available elongation within each sheet. This lack of uniformity makes fabrication of typical sheet metal detail parts with an acceptably low rejection rate difficult to attain. The strength of riveted joints in which monel rivets are used is considered to be adequate under both static and repeated loading. The spot-welded joints tested, while having adequate strength under static loading, failed after a relatively small number of repeated loadings. Developments in the details of melting and processing are expected to improve the forming characteristics of RC-130-A and make available a material of considerable usefulness in airframes. Report no. 8254. Authorized by Contract NOa(s)-10675.

FINAL REPORT OF THE WORK OF THE BARTOL RESEARCH FOUNDATION OF THE FRANKLIN INSTITUTE PERFORMED UNDER CONTRACT N8ONR-65101 WITH THE OFFICE OF NAVAL RESEARCH. IMRI F. PATAI, OFFICIAL INVESTIGATOR. REPORT by M. A. Pomerantz. Franklin Institute. Bartol Research Foundation, Swarthmore, Pa. Jun 1950. 53p diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105289

The ionization, condenser, photoelectric effect, and thermionic emission methods of determining contact potential differences are summarized; discussions are restricted to metal-metal contacts. Secondary electron emission behavior was determined by changes in dynatron characteristics of a triode upon the electrolytic introduction of Na into a tube through a glass wall. Exact values of δ, the ratio of secondary electrons to bombarding primary electrons, were measured as functions of the velocity of incident electrons. Secondary emission changes during activation and aging were observed. The equation $\delta = (I_a - \gamma I_g)/(I_g - I_a)$ was proposed for obtaining δ from the plate and grid currents, I_a and I_g, and the geometric factor $\gamma = E_a/E_g$, a function of the applied voltage.

FUNDAMENTAL EFFECTS OF COLD-WORKING ON CREEP PROPERTIES OF LOW-CARBON N-155 ALLOY, by D. N. Frey, J. W. Freeman and A. E. White. U. S. National Advisory Committee for Aeronautics. Oct 1951. 45p photos, diagrs, graph Microfilm $2.50, Photostat $6.25. PB 105416

Effects of cold-working under various conditions on the creep resistance at 1200°F and on the internal structure of low-carbon N-155 were determined in part by microscopic examination and X-ray diffraction. Effects of annealing at various times and temperatures on creep resistance and internal structure of the cold-worked samples were also partially evaluated. Cold-working was found to improve the creep

resistance of this alloy by the introduction of residual elastic stresses into the lattice. These stresses acted to prevent the movement of the fundamental creep flow units. NACA TN 2472.

FUNDAMENTAL INVESTIGATION OF THE CAUSES OF CRACKING IN WELDS AND ADJACENT PARENT METAL, BY A. J. WILLIAMS, R. D. WILLIAMS, AND C. B. VOLDRICH. SUMMARY REPORT ON CONTRACT N5-ORI-111, TASK ORDER I, PROJECT NR 031-003. Battelle Memorial Institute, Columbus, Ohio. Mar 1949. 57p photos, drawings, diagrs, tables Microfilm $2.75, Photostat $7.50. PB 105125

1. Alloys, High temperature - Welding 2. Welds - Cracking.

HYDROGEN EMBRITTLEMENT OF SAE 1020 STEEL, by J. B. Seabrook, N. J. Grant, Dennis Carney. Massachusetts Institute of Technology. Dept. of Metallurgy. Feb 1950. 30p photos, diagr, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105290

Specimens from hot-rolled 7/16-in. -diameter SAE 1020 rod containing 0.06 p.p.m. of H, 0.19% C, 0.40% Mn, 0.012% P, 0.036% S, 0.014% N, and 0.0011% N were used to determine the relation between H content and the degree of embrittlement. Analyses for H were made in a vacuum-fusion type of apparatus which extracted gas from the samples by fusion in a molten Sn-Fe bath. Consecutive samples could be analyzed every 15 min. to 0.03 p.p.m. Consistently high H values could be charged into the as-received 1020 steel at room temperature when a catalytic poison consisting of 2 g. of yellow P dissolved in 40 ml. of CS_2 were added to the electrolytic cell. Special tensile bars permitted charging the bar and samples simultaneously and analyzing for H while the bar was tested mechanically. Generally, the strain rate was constant at 0.05 per min. to keep the H loss from cold work nearly the same for the same amount of strain in all bars. A series of bars with nearly the same high H content pulled at strain rates of 0.01 to 6.0 p.p.m. indicated that at very high rates the H did not have time to diffuse and combine into H. No permanent damage to the lattice was caused by H itself. The elastic and yield values were not changed as H increased from 0.06 to 14.7 p.p.m., but the maximum increased without increase in hardness. Cathode charging aided by an electrolyte poison was rapid but not readily reproducible; a bend test was useful but no substitute for an accurate analytical method of determining H. Mechanical properties depended on the H content when tested, and elongation and reduction of area reached a minimum at about H = 5 p.p.m. H diffused rapidly from the charged samples during the first 3 or 4 hrs. but traces remained after 72. True stress-tone strain curves changed little with increasing H, and embrittlement decreased from a maximum at strain rates less than about 0.5 per min. to imperceptible at greater than 10 per min. The minimum strain needed to cause embrittlement in H-containing steels was greater than the elastic or yield strain for 1020 steel. Contract N5ori-78, Task order XVI, NR-031-186.

HYPOTHESIS FOR EXPLANATION OF THE EFFECTS OF SIZE OF SPECIMEN AND OF STRESS RAISERS ON THE VALUE OF THE ENDURANCE LIMIT OF METALS, by C. S. Yen. Illinois. University, Dept. of Theoretical and Applied Mechanics, Urbana, Ill. Feb 1950. 57p diagr, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105126

In order to formulate an explanation of "notch effect" and "size effect" in fatigue tests of metals, it was assumed in the light of recent fatigue theories, that the criterion for fatigue strength for any kind of specimen was based upon two material properties: (1) an "intrinsic endurance limit"; and (2) a critical amount of fatigue damage (closely related to the work-hardening capacity). After several trials, an expression for the critical amount of fatigue damage was formulated and equations were derived to express the property of notch-sensitivity and the fatigue limit for any rotating beam specimens, large or small, notched or unnotched. The resulting equations apparently agreed well with the general conclusions drawn from the observations of the phenomena of notch effect and size effect; other things being equal, the notch-sensitivity increased with increase of diameter or of material homogeneity of specimen, and decreased with increase of the relative stress gradient or the work-hardening capacity. Empirical methods were proposed to evaluate the material constants in the equations so that one may use the equations to predict the endurance limit for any rotating beam specimen. The available test results for several sizes of notched and unnotched specimens of six different steels gave endurance limits which deviated from those computed from the equations by amounts within ± 10.1 per cent. Technical report no. 16 on Behavior of materials under repeated stress (Contract N6ori-71, T. O. IV, Project NR 031-005).

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1. I. G. Farbenindustrie A. G., Oppau, Ger. 2. Iron carbonyls - Production - Germany 3. Iron carbonyls - Magnetic properties - Germany 4. Nickel carbonyl - Use in smelting - Germany 5. Micro BIOS FD 3003/49, Frames 1-40.

Abstract included. Abstract available as PB 105442s. 1p. Microfilm $1.25, Photostat $1.25. Some frames will not reproduce well. Includes drawings of high pressure machinery for iron carbonyl production referred to in BIOS FR 1575; also an article in two parts with title: Über die verarbeitung von carbonylnickelpulver in einschmelzbetrieben der deutschen eisen und stahlindustrie (On the use of carbonyl nickel powder in the smelting practice of the German iron and steel industry) by P. Assmann and L. Schlecht. Part 1 is reprinted from Stahl und eisen 1940.60.226. Part 2 is reprinted from Metallwirtschaft 1939.18. 467.

INVESTIGATION OF INFLUENCE OF CHEMICAL COMPOSITION ON FORGED MODIFIED LOW-CARBON N-155 ALLOYS IN SOLUTION-TREATED AND AGED CONDITION AS RELATED TO RUPTURE PROPERTIES AT 1200°F, by E. E. Reynolds, J. W. Freeman and A. E. White. U. S. National Advisory Committee for Aeronautics. Sep 1951. 111p tables, photos, diagrs Microfilm $4.75, Photostat $15.00. PB 105203

cooling and subsequent aging was found to improve the mean life and the initial failure time of the blades. This improvement was confirmed by statistical analysis. Metallographic examination revealed the presence of a lamellar structure in the improved blades. Other treatments investigated did not improve blade life. The blades were operated at 1500° F and 20,000 pounds per square inch at the blade mid-span. Samples of 20 and 22 blades were used. NACA TN 2513.

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EVALUATION OF THE HARDENING POWER OF QUENCHING MEDIA FOR STEEL, by Earl J. Eckel, Ross M. Mayfield, Glenn W. Wensch and Frank A. Rough. Illinois. Engineering Experiment Station, Urbana, Ill. Jun 1951. 131p photos, drawings, graphs, tables Available from Engineering Experiment Station, University of Illinois, Urbana, Ill. $1.50. PB 105163

1. Steel - Quenching media - Hardening effect 2. Steel - Hardening 3. ILU EES B 389.

Contents: Part I: Water, 9 percent brine, straight mineral oil, compounded oil, and air under agitated quenching conditions, by Earl J. Eckel. - Part II: Brines (0 to 25 percent sodium chloride) under agitated quenching conditions, by Earl J. Eckel and Ross M. Mayfield. - Part III: High temperature quenching oil and ethylene glycol under agitated conditions, by Earl J. Eckel and Glen W. Wensch. - Part IV: Water, brines and oils under still quenching conditions, by Earl J. Eckel and Frank A. Rough.

EVALUATION OF THE PROPERTIES OF TITANIUM AND TITANIUM-BASE ALLOY SHEET, by A. J. McCulloch, W. A. Reinsch, T. J. Virnelson, W. A. Pitman. United Aircraft Corp. Chance Vought Aircraft Div., Dallas, Texas. Feb 1951. 102p photos, drawings, graphs, tables Microfilm $4.50, Photostat $13.75. PB 105190

A preliminary investigation of the characteristics of available commercially pure and alloyed titanium sheet led to the selection for more extensive investigation of the manganese alloy of titanium produced in sheet form by Rem-Cru Titanium, Incorporated, and designated as RC-130-A. The investigation of this material showed that it possesses attractive mechanical properties but that its use in airframe fabrication is presently restricted by non-uniformity of available elongation within each sheet. This lack of uniformity makes fabrication of typical sheet metal detail parts with an acceptably low rejection rate difficult to attain. The strength of riveted joints in which monel rivets are used is considered to be adequate under both static and repeated loading. The spot-welded joints tested, while having adequate strength under static loading, failed after a relatively small number of repeated loadings. Developments in the details of melting and processing are expected to improve the forming characteristics of RC-130-A and make available a material of considerable usefulness in airframes. Report no. 8254. Authorized by Contract NOa(s)-10675.

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FUNDAMENTAL EFFECTS OF COLD-WORKING ON CREEP PROPERTIES OF LOW-CARBON N-155 ALLOY, by D. N. Frey, J. W. Freeman and A. E. White. U. S. National Advisory Committee for Aeronautics. Oct 1951. 45p photos, diagrs, graph Microfilm $2.50, Photostat $6.25. PB 105416

Effects of cold-working under various conditions on the creep resistance at 1200°F and on the internal structure of low-carbon N-155 were determined in part by microscopic examination and X-ray diffraction. Effects of annealing at various times and temperatures on creep resistance and internal structure of the cold-worked samples were also partially evaluated. Cold-working was found to improve the creep

resistance of this alloy by the introduction of residual elastic stresses into the lattice. These stresses acted to prevent the movement of the fundamental creep flow units. NACA TN 2472.

FUNDAMENTAL INVESTIGATION OF THE CAUSES OF CRACKING IN WELDS AND ADJACENT PARENT METAL, BY A. J. WILLIAMS, R. D. WILLIAMS, AND C. B. VOLDRICH. SUMMARY REPORT ON CONTRACT N5-ORI-111, TASK ORDER I, PROJECT NR 031-003. Battelle Memorial Institute, Columbus, Ohio. Mar 1949. 57p photos, drawings, diagrs, tables Microfilm $2.75, Photostat $7.50. PB 105125

1. Alloys, High temperature - Welding 2. Welds - Cracking.

HYDROGEN EMBRITTLEMENT OF SAE 1020 STEEL, by J. B. Seabrook, N. J. Grant, Dennis Carney. Massachusetts Institute of Technology. Dept. of Metallurgy. Feb 1950. 30p photos, diagr, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105290

Specimens from hot-rolled 7/16-in. -diameter SAE 1020 rod containing 0.06 p.p.m. of H, 0.19% C, 0.40% Mn, 0.012% P, 0.036% S, 0.014% N, and 0.0011% N were used to determine the relation between H content and the degree of embrittlement. Analyses for H were made in a vacuum-fusion type of apparatus which extracted gas from the samples by fusion in a molten Sn-Fe bath. Consecutive samples could be analyzed every 15 min. to 0.03 p.p.m. Consistently high H values could be charged into the as-received 1020 steel at room temperature when a catalytic poison consisting of 2 g. of yellow P dissolved in 40 ml. of CS_2 were added to the electrolytic cell. Special tensile bars permitted charging the bar and samples simultaneously and analyzing for H while the bar was tested mechanically. Generally, the strain rate was constant at 0.05 per min. to keep the H loss from cold work nearly the same for the same amount of strain in all bars. A series of bars with nearly the same high H content pulled at strain rates of 0.01 to 6.0 p.p.m. indicated that at very high rates the H did not have time to diffuse and combine into H. No permanent damage to the lattice was caused by H itself. The elastic and yield values were not changed as H increased from 0.06 to 14.7 p.p.m., but the maximum increased without increase in hardness. Cathode charging aided by an electrolyte poison was rapid but not readily reproducible; a bend test was useful but no substitute for an accurate analytical method of determining H. Mechanical properties depended on the H content when tested, and elongation and reduction of area reached a minimum at about H = 5 p.p.m. H diffused rapidly from the charged samples during the first 3 or 4 hrs. but traces remained after 72. True stress-tone strain curves changed little with increasing H, and embrittlement decreased from a maximum at strain rates less than about 0.5 per min. to imperceptible at greater than 10 per min. The minimum strain needed to cause embrittlement in H-containing steels was greater than the elastic or yield strain for 1020 steel. Contract N5ori-78, Task order XVI, NR-031-186.

HYPOTHESIS FOR EXPLANATION OF THE EFFECTS OF SIZE OF SPECIMEN AND OF STRESS RAISERS ON THE VALUE OF THE ENDURANCE LIMIT OF METALS, by C. S. Yen. Illinois. University, Dept. of Theoretical and Applied Mechanics, Urbana, Ill. Feb 1950. 57p diagr, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105126

In order to formulate an explanation of "notch effect" and "size effect" in fatigue tests of metals, it was assumed in the light of recent fatigue theories, that the criterion for fatigue strength for any kind of specimen was based upon two material properties: (1) an "intrinsic endurance limit"; and (2) a critical amount of fatigue damage (closely related to the work-hardening capacity). After several trials, an expression for the critical amount of fatigue damage was formulated and equations were derived to express the property of notch-sensitivity and the fatigue limit for any rotating beam specimens, large or small, notched or unnotched. The resulting equations apparently agreed well with the general conclusions drawn from the observations of the phenomena of notch effect and size effect; other things being equal, the notch-sensitivity increased with increase of diameter or of material homogeneity of specimen, and decreased with increase of the relative stress gradient or the work-hardening capacity. Empirical methods were proposed to evaluate the material constants in the equations so that one may use the equations to predict the endurance limit for any rotating beam specimen. The available test results for several sizes of notched and unnotched specimens of six different steels gave endurance limits which deviated from those computed from the equations by amounts within ± 10.1 per cent. Technical report no. 16 on Behavior of materials under repeated stress (Contract N6ori-71, T. O. IV, Project NR 031-005).

INTERROGATION OF DR. LEO SCHLECHT OF I. G. FARBEN AT BELTANE SCHOOL, WIMBLEDON, ON 17TH DEC 1946. British Intelligence Objectives Sub-Committee. Dec 1946. 42f drawings (Text in German and English) Microfilm $2.50, Enlargement Print $7.50. PB 105442

1. I. G. Farbenindustrie A. G., Oppau, Ger. 2. Iron carbonyls - Production - Germany 3. Iron carbonyls - Magnetic properties - Germany 4. Nickel carbonyl - Use in smelting - Germany 5. Micro BIOS FD 3003/49, Frames 1-40.

Abstract included. Abstract available as PB 105442s. 1p. Microfilm $1.25, Photostat $1.25. Some frames will not reproduce well. Includes drawings of high pressure machinery for iron carbonyl production referred to in BIOS FR 1575; also an article in two parts with title: Über die verarbeitung von carbonylnickelpulver in einschmelzbetrieben der deutschen eisen und stahlindustrie (On the use of carbonyl nickel powder in the smelting practice of the German iron and steel industry) by P. Assmann and L. Schlecht. Part 1 is reprinted from Stahl und eisen 1940.60.226. Part 2 is reprinted from Metallwirtschaft 1939.18. 467.

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Use of careful control over processing conditions in this investigation has shown that it is possible to correlate stress-rupture properties of forged alloys of the low-carbon N-155 alloy type at 1200°F with systematic variations in chemical composition and that a wide range in properties can be obtained by such variations. However, no alloy was obtained which had properties which were outstanding compared with those of the standard basic analysis of low-carbon N-155 alloy. NACA TN 2449.

INVESTIGATION OF THE FUNDAMENTAL FACTORS PROMOTING HIGH-TEMPERATURE STRENGTH OF ALLOYS, by C. C. McBride, A. R. Elsea, and G. K. Manning. Battelle Memorial Institute, Columbus, Ohio. Sep 1949. 54p photos, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105075

A study of the effects of nitrogen, iron, and nickel additions upon the alpha-beta transformation and the precipitation of gamma in cobalt-chromium alloys containing approximately 20 and 32 per cent chromium is described in this report. Data were obtained by metallographic examination of heat-treated specimens. They indicate that each of these elements lowers the alpha-beta transformation temperature range and promotes the formation of gamma, which appears quite similar to the compound in the binary cobalt-chromium system. Contract N5-ori-111, Task order I, Project NR 031-003.

KORROSIONSSCHUTZ VON ALUMINIUM UND ALUMINIUMLEGIERUNGEN (PROTECTION OF ALUMINUM AND ALUMINUM ALLOYS FROM CORROSION), by W. Wiederholt. Apr 1947. 33f (Text in German) Microfilm $2.25, Enlargement Print $6.25. PB 105458

1. Aluminum - Corrosion - Germany 2. Aluminum alloys - Corrosion - Germany 3. Coatings, Corrosion resistent - Germany 4. Coatings, Oxide - Germany 5. Coatings, Lacquer - Germany 6. Coatings, Metal - Germany 7. Micro BIOS FD 788/50, Frames 1-26.

English abstract included. Abstract available as PB 105458s. 1p. Microfilm $1.25, Photostat $1.25. Abridged edition of this paper is in FIAT Review of German Science, 1939-1946, Non-ferrous metallurgy, pt. I, p. 187-191.

KORROSIONSSCHUTZ VON MAGNESIUM (PROTECTION OF MAGNESIUM AGAINST CORROSION), by W. Wiederholt. 1947. 15f (Text in German) Microfilm $1.75, Enlargement Print $3.75. PB 105491

1. Magnesium - Corrosion prevention - Germany 2. Coatings, Corrosion resistant - Germany 3. Coatings, Ceramic - Germany 4. Coatings, Oxide - Germany 5. Micro BIOS FD 781/50, Frames 1-14.

English abstract included. Abstract available as PB 105491s. 1p. Microfilm $1.25, Photostat $1.25. Information from this paper is in FIAT Review of German Science 1939-1946, Non-ferrous metallurgy, Pt. I, p. 61-72.

6 KRIEGSJAHRE UMSCHMELZALUMINIUM IN DEUTSCHLAND (SIX YEARS OF WAR TIME REMELTING OF ALUMINUM IN GERMANY), by August Buckeley. 1947. 28f graphs, tables (Text in German) Microfilm $2.00, Enlargement Print $5.00. PB 105451

1. Scrap metal, Aluminum - Aluminum recovery - Germany 2. Aluminum alloys - Analysis - Germany 3. Aluminum alloys - Stress - Germany 4. Aluminum - By-products - Uses - Germany 5. Micro BIOS FD 785/50, Frames 1-27.

English abstract included. Abstract available as PB 105451s. 1p. Microfilm $1.25, Photostat $1.25. Chapters 9-13 only. Chapters 11-12 are referred to on p. 134 of FIAT Review of German Science, 1939-1946, Non-ferrous metallurgy, pt. I.

LOW TEMPERATURE HEAT CAPACITORS OF INORGANIC SOLIDS. V: HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS OF GALLIUM FROM 15° TO 300° K, by Eugene C. Kerr, George P. Adams and Herrick L. Johnston. Ohio State University Research Foundation, Columbus, Ohio. Jul 1949. 9p graph, tables Microfilm $1.25, Photostat $1.25. PB 105047

1. Gallium - Latent heat 2. Gallium - Thermodynamics 3. Ohio State University. Cryogenic Laboratory 4. Ohio State University. Dept. of Chemistry.

Contract N6onr-225, T. O. IV, ONR Project no. NR058-038. Project RF-283, Technical report no. 7. Contribution from the Cryogenic Laboratory and the Dept. of Chemistry, Ohio State University.

MANUFACTURE OF CUPROUS CHLORIDE. COLORING OF METALS. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. Feb 1947. 3f (Text in German) Microfilm $1.25, Enlargement Print $1.50. PB 105430

1. Copper chlorides - Production - Germany 2. Metals - Coloring - Germany 3. Micro BIOS FD 1412/49, Frames 1-2.

English abstract included.

METALLURGICAL INVESTIGATIONS CONCERNED WITH THE BEHAVIOR OF MATERIALS IN AN ENVIRONMENT OF LIQUID LEAD-BISMUTH ALLOY. FINAL REPORT UNDER CONTRACT N7-ONR-29523, NR-031-363, by R. C. Grassi, D. W. Bainbridge, R. O. Elliott. California. University. Institute of Engineering Research, Berkeley, Calif. Sep 1950. 59p photos, drawings, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105267

Stress-rupture properties at 1000°F of five low alloy and stainless steels are presented for environments of helium, hydrogen, and liquid lead-bismuth alloy of eutectic composition. Experiments designed to produce wetting of steels by liquid lead-bismuth are described. The methods include controlled atmospheres, electroplating and fluxing. The problem of wetting is discussed in relation to solution rate, and equilibrium solution determinations. Results of static type solution tests at 1400°F are given.

OXIDATION OF ZIRCONIUM AT HIGH TEMPERATURES, by Daniel Cubicciotti. Illinois Institute of Technology. Dept. of Chemistry, Chicago, Illinois. Nov 1949. 19p diagr, graphs, table Microfilm $1.75, Photostat $2.50. PB 105050

1. Zirconium - Oxidation.

Contract N7-onr-329, Task Order II: Reactions of metals with gases at high temperatures.

PAST WORK ON FATIGUE OF METALS IN THE HIGH TEMPERATURE FIELD, by Thomas J. Dolan. Illinois. University. Dept. of Theoretical and Applied Mechanics, Urbana, Ill. Jun 1950. 47p graphs, tables Microfilm $2.50, Photostat $6.25. PB 105249

A review is made of the principal concepts of high temperature fatigue behavior of metals as obtained from laboratory investigations. The interaction between time-dependent creep, and cycle-dependent fatigue phenomena apparently results in a rate of progressive damage which may be quite different from that predicted from simple superposition of effects obtained in separate tests. In evaluating the significance of data from high temperature fatigue tests, the following factors must be given careful consideration: (a) the frequency of repetition of the stress cycle; (b) the metallurgical instability of most metals at high temperature; (c) the influence of surface effects (erosion, oxidation, or chemical changes); (d) the accentuation of time-dependent creep caused by the superposition of a mean or steady stress; and (e) the lack of knowledge regarding the reduction of fatigue strength caused by "stress raisers". It is concluded that fundamental information is needed on the nature of the phenomena limiting the life of a metal in high temperature fatigue before accurate methods can be evolved for prediction of useful service life of specific components. Technical report no. 17 on "Behavior of materials under repeated stress". Contract N6-ori-71, T. O. IV, Project NR031-005. Presented at a conference on "Fatigue of metals at high temperature "sponsored by the Materials Panel of Project Squid, U. S. Navy, in Washington, D. C. on May 24, 1950. Text of papers and discussion will be published as an official Project Squid report.

PLATINUM GROUP METALS OF JAPAN, by Melvin Pollard. Supreme Commander for the Allied Powers. Natural Resources Section. Sep 1951. 30p maps, tables Microfilm $2.00, Photostat $3.75. PB 105349

1. Platinum - Japan 2. SCAP NRS PS 66.

REACTIONS OF METALS WITH GASES AT HIGH TEMPERATURES. TECHNICAL REPORT NO. 7: REACTION BETWEEN OXYGEN AND THORIUM, by Pascal Levesque and Daniel Cubicciotti. Illinois Institute of Technology. Dept. of Chemistry, Chicago, Illinois. Jun 1950. 18p graphs, tables Microfilm $1.75, Photostat $2.50. PB 105288

The rate of consumption of O gas by Th in the range of 350 to 700°C was compared with other group IV B metals. A 2-sq. cm. sample of Th was placed in an SiO_2 bulb of an electric muffle furnace. Another bulb was left empty, and the whole system was evacuated to a few microns. Oxidation was traced by observing the drop in O pressure. O consumed was plotted as a function of time at 450 to 550°C. Oxidation following the induction period obeyed the parabolic law, and the rate constant appeared independent of temperature from 550 to 700° C. Oxidations below 450°C were isothermal, and the curves were linear in time. From 350 to 450°C, the rate constants for the linear oxidations were measured and the energy of activation was 22 kcal./mole. At 400°C in 30 min., a sq.cm. of Th reacted with 0.14 mg. of O while Zr reacted with 0.035 mg. and Ti with 0.012 mg. X-ray diffraction pictures yielded patterns which showed only lines corresponding to Th and ThO_2. Contract N7-onr-329, Task order II.

REPORT OF THE INTERROGATION OF HERR GUTBROD (SIEMENS & HALSKE) DEALING WITH THE MANUFACTURE AND FABRICATION OF TANTALUM. British Intelligence Objectives Sub-Committee. Jul 1947. 20f drawings Microfilm $1.75, Enlargement Print $3.75. PB 105443

1. Tantalum - Fabrication - Germany 2. Tantalum - Manufacture 3. Tantalum - Uses - Germany 4. Wire, Tantalum - Germany 5. Furnaces, Sintering - Design - Germany 6. Micro BIOS FD 3002/49, Frames 1-15.

Abstract included. Abstract available as PB 105443s 1p. Microfilm $1.25, Photostat $1.25.

SOME PHYSICO-CHEMICAL STUDIES ON GALLIUM AND THALLIUM COMPOUNDS, by Therald Moeller and Glendall Lee King. Illinois. University, Urbana, Illinois. Nov 1949. 56p photos, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105350

An experimental standard-frequency broadcast station, WWVH, was set up a Maui, T. H., so that data might be collected and used in determining answers to many problems which have arisen in connection with extension of standard-frequency time-signal service by operation of more than one station on the frequencies internationally assigned for such services. This paper describes the site chosen for WWVH and the experimental equipment used in establishing and maintaining it. Good results have been obtained at a temporary location. Contract N6 ori-71, Chemistry task no. XVII.

STRESS RUPTURE TESTS ON SHEET ALLOYS FOR HIGH TEMPERATURE APPLICATIONS, by I. Perlmutter. U. S. Air Materiel Command. Engineering Division. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Jul 1950. 44p photos, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105241

Stress-rupture tests at 1500°F were conducted on six alloys of different bases and on eight stainless steel modifications, all in sheet form. Rupture tests at 1200°F were also made on one of the stainless steel modifications to complete the comparison at that temperature. In addition, the sheet alloy V-36 an Air Force development, was evaluated in stress-rupture at 1700° and 1800°F. Metallographic studies were made on all materials before and after rupture tests, and the effect of the latter on residual ductility was measured approximately. At 1200°F. GT-45 was comparable in rupture strength to the strongest of the other stainless steel modifications tested at that temperature. At 1500°F the highest rupture strength in the alloy group was noted in S-816 and S-590, followed by Inconel X. The latter exhibited the lowest rupture elongation but the highest residual ductility (exclusive of the very low rupture strength, non-heat treatable Inconels). The alloy S-590 had the lowest residual ductility in the group. In the stainless steel modification group, GT-45 had the highest rupture strength characteristics at 1500°F and the least rupture elongation. The stainless steels 347 and 321 exhibited the lowest rupture strength. Satis-

factory room temperature residual ductility was noted in all the stainless steels except 310 plus silicon, which was very badly embrittled after testing at 1500°F. The materials tested exhibited varying degrees of structural instability at 1500°F. Sigma phase was identified in the stainless steels 19-9DL, 18-8 SCb, and Modified 317 in the form of pools or islands, and 310 plus silicon, in acicular form. However, only the latter was seriously embrittled. Overaging was observed in Inconel X, which also exhibited and abnormal surface structural condition. Unexpected, excessive coagulation of precipitate was observed in S-816, S-590, and N-155. The rupture strength of the alloy V-36 was found to be within the specification established by the Air Materiel Command, the values at 1800°F being equal to or better than those of sheet Vitallium at 1700°F. The residual ductility after testing at 1700°F and 1800°F is considered satisfactory. Room temperature ductility of the solution treated but unaged material appears adequate for some types of fabrication operations. AAF TR 6188.

STUDY OF THE CHEMISTRY OF COLUMBIUM, TANTALUM AND SOME ASSOCIATED TRANSITION ELEMENTS. FINAL REPORT ON CONTRACT N6-ONR-263, TASK ORDER VI, PROJECT NR 052116 COVERING THE PERIOD JAN 1, 1948 TO OCT 31, 1949, by Russell Atkinson, Morris Berenbaum, Jovan Moacanin, Stephen Moros, Robert Wolke, Michael Yamin. Work directed by C. F. Hiskey and J. Steigman. Polytechnic Institute of Brooklyn. Oct 1949. 20p tables Microfilm $1.75, Photostat $2.50. PB 105099

A method of complete chlorination of columbium oxide and some related oxides at atmospheric pressure in a simple reflux and distillation apparatus was found with octachloropropane (C_3Cl_8). The reaction is quantitative with columbic oxide. Titanium dioxide alone does not react, but in the presence of columbic oxide reacts completely under certain conditions. Tantalum pentoxide reacts with difficulty, but in the presence of columbic oxide chlorinates more readily (although not completely). It is necessary to use pure octachloropropane and to ignite the various oxides at high temperatures in order to obtain the maximum conversion to chloride. A standardized method of synthesizing columbium pentachloride at atmospheric pressure, with a high yield and high purity, was achieved. The organic products of the chlorination were determined. The reaction appears to be acid-catalyzed. A number of other transition oxides were chlorinated by means of octachloropropane at atmospheric pressure. Increased basicity of oxide means less chlorination product. A modification in the apparatus permitted the quantitative separation of titanium and the quantitative retention of columbium. Spectroscopically pure columbic oxide was prepared. Other oxides, except for ferric oxide, did not interfere in the separation. Columbite ores could not be chlorinated at atmospheric pressure. The suggested analytical procedure for ores involves pyrosulfate removal of iron, manganese and tin as sulfides, removal of titanium by chlorination, and determination of tantalum in the presence of columbium colorimetrically. The latter determination is very sensitive to impurities. The chemistry of trivalent columbium ion, produced electrolytically, was qualitatively investigated. The reduction in sulfuric acid was not complete, and some hydrogen sulfide was evolved. Some preliminary absorption spectra were taken. Anhydrous columbium pentachloride dissolved in carbon disulfide was found to react with potassium iodide to yield a dark precipitate, some dissolved material and iodine. No simple stoichiometric relations emerged from the quantitative assay of precipitate and solution. The columbium in the precipitate was in a reduced form.

SURVEY OF WORK DONE AT DEGUSSA 1939-1945 ON BERYLLIUM, TITANIUM, ZIRCONIUM, URANIUM, AND THORIUM, by W. Schulenberg and others. Industrial utilization of noble metals, by K. W. Fröhlich. Deutsche Gold und Silberscheideanstalt, Frankfort, Ger. 1946. 35f (Text in German and English) Microfilm $2.25, Enlargement Print $6.25. PB 105450

1. Beryllium - Production - Germany 2. Thorium - Production - Germany 3. Titanium - Production - Germany 4. Uranium - Production - Germany 5. Zirconium - Production - Germany 6. Gold - Uses - Germany 7. Iridium uses - Germany 8. Osmium - Uses - Germany 9. Palladium - Uses - Germany 10. Platinum - Uses - Germany 11. Rhodium - Uses - Germany 12. Ruthenium - Uses - Germany 13. Silver - Uses - Germany 14. Micro GDC 42778T 15. Micro BIOS FD 772/50, Frames 1-33.

English abstract included. Abstract available as PB 105450s. 2p. Microfilm $1.25, Photostat $1.25. Papers are included in FIAT Review of German Science, 1939-46, Non-ferrous metallurgy, pt. I, p. 1-4, 31-36 and pt. II, p. 17-25. Translation of p. 1-4 (Beryllium) is GDC 4278T.

TRANSFORMATION OF AUSTENITE IN A LOW-CARBON, NICKEL-MOLYBDENUM STEEL DEPOSITED AS WELD METAL, by E. F. Bailey and W. J. Harris, Jr. U. S. Naval Research Laboratory. Jul 1951. 12p photos, diagr, graphs, table Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50. PB 105298

Isothermal decomposition studies were made on small sections cut from a weld pad of the following composition: 0.08% C, 0.45%Si, 1.05% Mn, 2.00% Ni, 0.75% Mo, 0.25% V, 0.25% Cr. The TTT diagram had three reaction ranges-upper and intermediate types of nucleation and growth reactions with no eutectoid microstructure, and a martensite reaction at lower temperatures. A continuous-cooling diagram obtained by dilatometry indicated initiation of the transformations along horizontal temperature shelves except in the regions of partial suppression. A completely martensitic structure was obtained only at water-quenching rates. NRL R 3849.

ÜBER EINE METHODE DER BESTIMMUNG VON WASSERSTOFF INSBESONDERE IN MAGNESIUM (A METHOD FOR THE ESTIMATION OF HYDROGEN IN METALS, PARTICULARLY IN MAGNESIUM), by Franz Sauerwald. I. G. Farbenindustrie A. G., Bitterfeld, Ger. 1942. 12f (Text in German) Microfilm $1.75, Enlargement Print $3.75. PB 105407

1. Metals - Hydrogen content - Germany 2. Magnesium - Hydrogen content - Germany 3. Hydrogen - Determination - Germany 4. Micro BIOS HEC 10194 5. Micro BIOS FD 309/51, Frames 1-11.

English abstract included. Abstract available as PB 105407s. 1p. Microfilm $1.25, Photostat $1.25. Versuchsbericht 85/1942.

X-RAY ABSORPTION FACTORS FOR COATED CYLINDERS AND THEIR APPLICATION IN THE MEASUREMENT OF THIN FILMS, BY EUGENE B. HENSLEY. MISSOURI UNIVERSITY. DEPT. OF PHYSICS, COLUMBIA, MO. TECHNICAL REPORT NO. 3 UNDER CONTRACT N7 ONR-292, T. O. 5, NR 074 081. Sep 1950. 15p photo, graphs Microfilm $1.75, Photostat $2.50. PB 105353

Absorption factors for the calculation of Debye-Scherrer powder diffraction intensities from a thin crystalline film of thickness ℓ on a cylindrical absorbing core were computed using numerical methods. Also computed were the corresponding absorption factors for x-rays diffracted from the underlying base material. In addition to the use of these absorption factors for the calculation of x-ray powder diffraction intensities, their application in the measurement of thin cylindrical surface films is discussed. The validity of this method of measurement was checked using thin films of Cu electroplated on Ni wires.

METEORALOGY AND CLIMATOLOGY

METEOROLOGICAL ASPECTS OF TURBULENCE AFFECTING AIRCRAFT AT HIGH ALTITUDE, by J. K. Bannon. Gt. Brit. Air Ministry. Meteorological Office. 1951. 15p tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.15. PB 105327

1. Atmosphere - Turbulence - Meteorological aspects - Gt. Brit. 2. Airplanes - Altitude effects - Meteorological aspects - Gt. Brit. 3. AM MO 524d.

Professional notes no. 104 (Fourth number of Volume VII). S. O. Code no. 40-47-10-4.

PROJECT CIRRUS. FINAL REPORT ISSUED UNDER CONTRACT NO. W-36-039-SC-38141, PREPARED by Irving Langmuir, Duncan C. Blanchard, Raymond E. Falconer, W. E. Hubert, Vincent J. Schaefer, Bernard Vonnegut, H. J. Wells, Charles A. Woodman. General Electric Co. Research Laboratory, Schenectady, N. Y. Jul 1951. 362p photos, drawings, diagrs, graphs, tables Microfilm $9.00, Photostat $46.25. PB 105413

1. Clouds - Formation 2. Rain, Simulated 3. GE RL 566 4. SIG Contract W36-039-sc-38141, Final report.

GE Requisition EDG 25022. Dept. of the Army project 3-99-07-022. Signal Corps project: 172 B. Work on current projects will be continued under a new contract. Includes Occasional reports no. 11-25, 28-29 (also issued separately as PB 103177 (no. 11); PB 98981 (no. 13); PB 99102 (no. 14); PB 100913 (no. 15); PB 100914 (no. 16); PB 100915 (no. 17); PB 100916 (no. 18); PB 110239 (no. 20); PB 102817 (no. 21); PB 102314 (no. 22); PB 102315 (no. 23); PB 102316 (no. 24); PB 103178 (no. 25); PB 104809 (no. 28). Occasional reports 1-10 in PB 101683.

THUNDERSTORM ELECTRICITY. FINAL REPORT, NOV 15, 1948 TO DEC 15, 1950, PREPARED by S. E. Reynolds and Clyde W. Harris. New Mexico. School of Mines. Research and Development Division. Apr 1951. 154p photos, drawings, graphs, tables Microfilm $6.00, Photostat $20.00. PB 105000

1. Thunderstorms - Electrical properties 2. Electricity, Atmospheric 3. Ice - Electrical properties 4. Clouds - Seeding 5. Silver iodide - Effect of sunlight.

Dept. of the Army project: 3-99-07-022. Signal Corps project: 24-172B-1. Contains the following appendices: A. Time of rise and fall of cumulus cloud tops, by E. J. Workman and S. E. Reynolds (From Bulletin of the American Meteorological Society, vol. 30, no. 10, Dec 1949, p. 359-361). - B. Electrical phenomena occuring during the freezing of dilute aqueous solutions and their possible relationship to thunderstorm electricity, by E. J. Workman and S. E. Reynolds (From Physical review, vol. 78, no. 3, p. 254-259, May 1, 1950). - C. Electrical phenomena resulting from the freezing of dilute aqueous solutions, by E. J. Workman and S. E. Reynolds (Presented before the American Physical Society, Chicago, Ill., Nov. 27, 1948). - D. Electrical charge separation produced by rapid freezing of rainwater, by S. E. Reynolds and E. J. Workman (Presented at same meeting). - E. Electrical phenomenon observed during the freezing of a non-homogeneous aqueous solution, by S. E. Reynolds and E.J. Workman (From Nature, v. 164, Nov 26, 1949). - F. Electrical properties of thunderstorms and a suggested method of charge generation, by W. J. Workman (Presented before the American Geophysical Union, Washington, D. C., Apr 21, 1949). - G. Some electrical properties of water, by W. J. Workman and S. R. Reynolds (Presented before the Radio Wave propagation Symposium, Naval Electronics Laboratory, San Diego, Calif., July 29, 1949). - H. Some electrical properties of the ice of dilute aqueous solutions, by E. J. Workman (Presented before the National Academy of Sciences, Schnectady, N. Y. Oct 12, 1950). - I. Some observations bearing on the physical basis for cloud seeding, by E. J. Workman (Presented before the American Physical Society, Los Angeles, Calif., Dec. 30, 1950). - J. Effect of sunlight on the action of silver iodide particles as sublimation nuclei, by S. E. Reynolds and Wm. Hume II. Bernard Vonnegut and Vincent J. Schaefer (Bulletin of the American Meteorological Society, Feb 1951).

MINERALS AND MINERAL PRODUCTS

DEVELOPMENT OF LIGHTWEIGHT AGGREGATE FROM FLORIDA CLAYS, by A. F. Greaves-Walker, S. L. Bugg and R. S. Hagerman. Florida. Engineering and Industrial Experiment Station, Gainesville, Fla. Sep 1951. 25p photos, map, graphs, tables Available from Florida Engineering and Industrial Experiment Station, University of Florida, Gainesville, Fla. PB 105509

1. Aggregates, Lightweight 2. F EES B46.

Engineering progress at the University of Florida, vol. V, no. 9.

EFFECT OF THERMAL TREATMENT ON THE DIELECTRIC PROPERTIES OF CERAMIC BODIES, TECHNICAL REPORT NO. 1, APR 1, 1949-JUNE 1, 1950, UNDER CONTRACT NO. N8ONR 66502, PROJECT NO. NR 032316, by E. M. Tuttle and H. W. Wilson. North Carolina State College. Dept. of Engineering Research, Raleigh, N. C. Jun 1950. 58p photos, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105294

Twenty-one references are reviewed which describe the controlling factors of crystallization in glassy media. The development of ferroelectric crystals of $NaTaO_3$, $KTaO_3$, $NaCbO_3$, and $KCbO_3$ in glasses was investigated; these compounds exhibited perovskite structures, dielectric hysteresis loops, and the properties of spontaneous polarization, piezoelectricity, and polymorphic transitions below their Curie points. Transparent glass formation below 1300°C and perovskite crystal production on devitrification were studied for 25 Ta and Cb oxide compositions. $NaTaO_3$ dielectric constant measurements were apparently complicated in the region of 500°C by conductive effects caused by softening near the Curie point (475°C). Cb_2O_5, in the presence of SiO_2, appeared to be a glass former. The rate of $NaTaO_3$ crystal growth was observed at the surface and within the glass below 1050°C; surface growth above 1050°C was enhanced by larger temperature gradients and compositional changes. X-ray powder diffraction and petrographic analyses of the crystal phases in devitrified 15% CaO-15% Na_2O-70% SiO_2 glass indicated larger concentrations of the secondary devtrite than the primary wollastonite. Devitrification effects were reflected in dielectric constants which decreased after crystallization but remained constant with the length of the devitrification period. Power factors at LF's increased proportionally with thermal exposure times.

FLAME FUSION SYNTHESIS OF SILICATE STRUCTURE TYPES, by W. H. Bauer and I. Gordon. New Jersey Ceramic Research Station, Rutgers University, New Brunswick, N. J. May 1950. 60p photo, drawings, graph Microfilm $2.75, Photostat $7.50. PB 105362

Specimens of the fundamental structural types of silicates were synthesized. A calcined homogeneous mass of the orthosilicate forsterite (42.69% SiO_2, 57.31% MgO) which was produced at 2100°F fused at 2985°F. Fayalite and tephroite syntheses did not yield homogeneous masses. The pyrosilicates gehlenite and akermanite formed glassy or poorly shaped boules; calcination of hardystonite (35.75% CaO, 25.95% ZnO, 38.30% SiO_2) at 1950°F for 1.5 hrs. and fusion at 2160°F gave small, clear boules which were probably crystals of pseudowollastonite in solid solution with Zn. The metasilicates pseudowollastonite (51.70% CaO, 48.30% SiO_2), enstatite (40.16% MgO, 59.84% SiO_2), and Li metasilicate (33.22% Li_2O, 66.78% SiO_2) were calcined for 1.5 hrs. at 2150°, 2100°, and 1652° F and were fused at 2240°, 2390°, and 1835° F, respectively. Large multicrystalline boules of Li disilicate (19.92% Li_2O, 80.08% SiO_2) were grown; the disilicate was calcined at 1450°F for 2 hrs. and was fused at 1730°F. Small, clear, apparently unicrystalline boules of celsian (40.89% BaO, 27.13% Al_2O_3, 31.97% SiO_2). a dioxide type, were calcined at 1950°F after 1.5 hrs. and fused at 2600°F. The tendency toward glass formation increased with an increase in the number of links between Si tetrahedra. Crystal growth and the rate of nucleus formation increased with undercooling in pyrogenous synthesis but decreased with further undercooling as diffusion became the controlling factor. The failures reported for the Mn- and Fe-containing compounds indicated chemical limitations to the flame-fusion process. Technical report no. 2 on Contract N7 onr-454, T. O. 2.

HIGH TEMPERATURE CERAMICS IN SOUTH GERMANY. REPORTED by N.H.G. Daniels and R. L. Bickerdike. British Intelligence Objectives Sub-Committee. May 1945. 40p tables (Text in English and German) Microfilm $2.25, Photostat $5.00. PB 105307

1. Ceramics, Heat resisting - Germany 2. Deutsche Gold- und Silberscheideanstalt A. G., Frankfurt, Ger. 3. Electro Schmelzwerke A. G., Kempten, Ger. 4. Maschinenfabrik Augsburg-Nürnberg, A. G., Nürnberg, Ger. 5. BIOS FR 23, Items 18, 21, 26.

Appendix I. List of papers published since 1939, by D. E. Ryschkewitsch. (Text in German). - Appendix II. Unfinished, unpublished paper, by Dr. Jaeger. (Text in German). - Appendix III. Unpublished report by Dr. Ryschkewitsch (Translation) is not included.

HYDROGEN PERMEABILITY OF ZIRCONIUM, by Richard B. Bernstein and Daniel Cubicciotti. Illinois Institute of Technology. Dept. of Chemistry, Chicago, Ill. Nov 1949. 23p diagr, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105256

The rate of permeation of hydrogen through ductile zirconium sheet was measured over the temperature range 400-900°C. The permeability was found to decrease approximately exponentially with a half-time of about 1.5 hours. An apparent energy of activation for the process of permeation was estimated. The flow rate was found to be proportional to the square root of the hydrogen pressure. Contract N7-onr-329, Task order II: Reaction of metals with gases at high temperature. Technical report no. 3.

INTRODUCTION TO REACTIONS IN THE SOLID STATE. New York State College of Ceramics, Alfred, N. Y. Mar 1950. 92p diagrs, graphs, tables Microfilm $4.25, Photostat $12.50. PB 105261

The influences of crystal structure and diffusion mechanisms on solid state reactions were investigated. Classification of the reactions is discussed from 3 viewpoints: the crystallographic changes occurring in reactions, the state of materials produced by reactions, and the geometrical considerations of the crystalline structures involved. Summaries are given of the factors affecting crystal structure, geometric configurations, crystal defects, and equilibrium ionic and energy disorders. Equations are derived for the diffusion constant according to 4 mechanisms of crystal lattice migration: zeolitic diffusion, migration of Schottky defects, migration of Frenkel defects, and place exchange diffusion. The Jander and Huttig explanations of the stages in solid state reactions are outlined. The velocity equation of such reactions, the factors which reduce crystal rigidity, and the influence of crystallographically different surfaces and foreign substances in the lattice are reviewed. Summaries of

20 research papers on ceramic systems and the proceedings of the International Colloquium on solid state reactions are presented. Contract N6ori-143, NR-032-022.

INVESTIGATION OF FUNDAMENTAL PROPERTIES OF ELEMENTS AND THEIR COMPOUNDS INCLUDING THE RARE EARTHS AT VERY LOW TEMPERATURES WITH PARTICULAR EMPHASIS UPON SUPER-CONDUCTIVITY, BY W. T. ZIEGLER. GEORGIA INSTITUTE OF TECHNOLOGY. STATE ENGINEERING EXPERIMENT STATION, ATLANTA, GA. ANNUAL REPORT FOR THE PERIOD OCT 1, 1947 THROUGH SEP 30, 1948 ON PROJECT NO. 116-18. Feb 1949. 42p photos, diagrs (1 fold), tables Microfilm $2.50, Photostat $6.25. PB 105096

1. Low temperature research 2. Liquefiers, Gas 3. Cryostats 4. Hydrogen - Purification 5. Helium - Production 6. Earths, Rare - Chemical properties 7. Earths, Rare - X-ray inspection 8. Cerium - Properties 9. Lanthanum - Properties 10. Neodymium - Properties 11. Praseodymium - Properties

Contract N6-ori-192, Task order I. See also PB 98612.

ORGANIC TELLERIUM COMPOUNDS, by John S. Suttle. New Mexico University. n.d. 15p Microfilm $1.75, Photostat $2.50. PB 105358

The linkage between 2 Te atoms in several compounds was investigated. PrO, BuO, and EtO-MeO groups were substituted in Ph Te trichloride and Ph ditelluride to form new compounds. The structure of the ditellurides was not concluded; Te either failed to enter into reaction or reacted with the elimination of Te. A rapid and accurate method of volumetric analysis was developed for the determination of Te in organo-metallic compounds. Contract N8 onr 75500, NR 055174.

STRUCTURAL AND COMPOSITIONAL RELATIONSHIPS OF THE LITHIUM ALUMINOSILICATES: EUCRYPTITE, SPODUMENE, AND PETALITE, by Rustum Roy, Della M. Roy, E. F. Osborn. Pennsylvania State College. School of Mineral Industries, State College, Pa. Jun 1949. 21p diagrs, tables Microfilm $2.00, Photostat $3.75. PB 105092

An investigation has been made of phase equilibria both at the liquids and at temperatures much below the solidus along the join eucryptite ($LiAlSiO_4$)-silic (SiO_2), in the system Li_2O-Al_2O_3-SiO_2. Data are presented and discussed bearing on the stability and compositional relationships of the three lithiaaluminosilicates: eucryptite, spodumene, and petalite. Using hydrothermal equipment in which both pressure and temperature have been controlled and measured, each of these three minerals has been synthesized. Eucryptite was found to be uniaxial positive, with $\omega = 1.572$, $\epsilon = 1.587$, data conflicting with those previously given for this mineral. Eucryptite inverts, at $972^{\circ} \pm 10^{\circ}C$, to a high temperature from which melts incongruently. Spodumene inverts to a high temperature form at a maximum temperature of 505°C (at 10,000 psi). Petalite decomposes congruently to a high silica spondumene solid solution at $680^{\circ} \pm 10^{\circ}C$. A diagram (Fig. 2) is presented to show the present concept of phase relations along the join. Contract N6onr-26909, NR071-062, Code 428, 1st technical report.

PACKING AND PACKAGING

PROCEEDINGS OF PANEL ON ORDNANCE MATERIALS MEETING ON PRESERVATION OF MATERIAL AND PACKAGING, 13 DECEMBER 1950. U. S. Research and Development Board. 1950. 117p photos, graphs Microfilm $4.75, Photostat $15.00. PB 105172

1. Ordnance materials - Preservation 2. Ordnance - Corrosion - Prevention 3. Ordnance - Crating and packing 4. Ordnance, Aircraft - Preservation 5. Tropical deterioration - Prevention 6. Electrical equipment - Fungus proofing 7. Electronic equipment - Fungus proofing 8. Guns - Corrosion prevention 9. Textiles - Fungus proofing 10. Coatings, Protective - Materials 11. Leather - Fungus proofing 12. Fungus proofing 13. Moisture proofing 14. Inhibitors, Vapor phase 15. Inhibitors, Corrosion 16. Weapons - Crating and packing 17. Corrosion - Prevention 18. Rifles - Coatings 19. Packaging - Moisture proofing - Tests 20. Wood - Preservation 21. Insulating materials, Fungus resistant 22. Insulation, Electrical - Fungus resistance.

J. R. Townsend, Chairman of Panel. Contents: Introductory remarks, by J. R. Townsend. p. 1-2. - Field conditions and environmental factors, by K. G. Compton. p. 3-7. - Simulated tropical conditions in the laboratory, by J. M. Wilson. p. 8-15. - Degradation of electrical equipment owing to tropical atmosphere, by A. W. Rogers. p. 16-19. - Ordnance field problems, by Max Frager. p. 20-23. - Textile and leather problems, by Ray Treichler. p. 24-28. - Tropical testing chamber at Ft. Belvoir, by R. E. Vicklund. p. 29-31. - Vapor phase inhibitors, by Gilbert Foster. p. 32-36. - Moisture and fungus protection, by Walter N. Ezekiel. p. 37-41. - Ordnance packaging development, by H. T. Decot. p. 42-46. - Engineering approach to preservation and packaging problems, by G. S. Mustin. p. 47-55. - The Fort Sherman tests, by J. M. Leonard. p. 56-59. - Airborne packaging problems, by W. D. Long. p. 60-64. - Wood preservation, by G. M. Hunt. p. 65-70. - Appendix I. Insulation resistance measurements made at Oahu Signal Depot during January 1946. p. 71-73. Appendix II. References (G. S. Mustin Paper). p. 76-77.

PHOTOGRAPHIC AND OPTICAL GOODS

GERMAN PHOTOGRAPHIC MOUNT AND ALBUM INDUSTRY, PHOTOGRAPHIC FRAMES, ETC., REPORTED BY A. E. BARTON SMITH AND H. LESLIE ARNOTT. BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE. B.I.O.S. INVESTIGATION TRIP NO. 2537. n.d. 13f Microfilm $1.75, Enlargement Print $3.75. PB 105648

1. Rommel, O., A. G., Nerchau, Ger. 2. Poeschal & Dreschsel, Nerçhau, Ger. 3. Frames - Germany 4. Albums (Photography) - Germany 5. BIOS FR 901 6. Micro BIOS FD 3079/48, Frames 1-13.

MEDICAL RESEARCH CAMERA, by Harry R. White, Royal S. Sparkman, William C. Sparkman, Harvey F. Kohnitz. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Oct 1951. 7p photos, tables Microfilm $1.25, Photostat $1.25. PB 105471

The Medical Research Camera was fabricated at the School of Aviation Medicine to accomplish research photography in small body cavities which cannot be photographed by a standard camera. The Medical Research Camera consists of a 35-mm. mechanism, self-contained light and power source, focusing mechanism, and focusing light, single-lens reflex viewing, reflector mirror to direct the light rays to coincide with the axis of the taking lens, and interchangeable lenses. AAF SAM Proj. 21-52-001.

MOTION PICTURES AND FILM STRIPS. FOUNDRY PRACTICE, U. S. DEPARTMENT OF COMMERCE, OFFICE OF TECHNICAL SERVICES. 1951. 38p Available from Office of Technical Services, Washington 25, D. C. Mimeo: $.50. PB 105715

Contains listing of all known motion pictures and strip films on foundry practice. Film titles and sources are indicated. Each film carries a comprehensive digest of its contents. FB 1.

PRACTICAL PRINCIPLES GOVERNING THE PRODUCTION AND UTILIZATION OF SOUND MOTION PICTURES. PRELIMINARY REPORT ON PROJECT NO. 4: ABSTRACT OF CONCLUDING CHAPTER OF CRITICAL EVALUATION AND SUMMARY OF EXPERIMENTAL LITERATURE ON INSTRUCTIONAL FILMS, by Charles F. Hoban, Jr. and Edward B. van Ormer. Pennsylvania State College, State College, Pa. Aug 1950. 19p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.50. PB 105687

1. Motion pictures, Educational 2. Motion pictures, Sound 3. Instructional film research program.

REPORT ON THE DEVELOPMENT OF A METHOD FOR 50,000 EXPOSURES/SEC. OF STANDARD SIZE FILM UNDER DIRECT LIGHTING, by Kurt Altner and Dietrich Kreidel. Rheinmetall-Borsig A. G., Unterluss, Ger. Jan 1946. 26f drawings (Text in German) Microfilm $2.00, Enlargement Print $5.00. PB 105736

1. Photography, Ballistic - Germany 2. Photographic equipment - Germany 3. Intervalometers, Camera - Germany 4. Micro BIOS HEC 10842 5. Micro BIOS FD 2428/46, Frames 93-116.

English abstract included.

PHYSICS

General

ANALYTIC DETERMINATION OF THE FLOW BEHIND A SYMMETRICAL CURVED SHOCK IN A UNIFORM STREAM, by C. C. Lin and S. F. Shen. U. S. National Advisory Committee for Aeronautics. Oct 1951. 45p diagrs Microfilm $2.50, Photostat $6.25. PB 105318

A power-series-expansion method is used to determine the flow pattern behind a detached curved shock in a uniform stream. The limitations of the method are discussed and earlier applications are extended to include more terms and to give improved accuracy. The analysis is carried out in a manner applicable to both the two-dimensional and the axially symmetrical cases. The particular example with free-stream Mach number 1.7 is computed in the axially symmetrical case by using a fourth-degree polynomial to represent the flow and comparison is made with experimental results. NACA TN 2506.

APPARATUS AND TECHNIQUE FOR SOUND VELOCITY MEASUREMENTS, by Preston W. Smith, Jr. Harvard University. Acoustics Research Laboratory. Aug 1949. 29p diagrs, graph Microfilm $2.00 Photostat $3.75. PB 105028

This report discusses the apparatus and technique developed for precision measurement of the velocity of sound in gases at audiofrequencies. In order to obtain sufficient control of the gas composition and temperature it is necessary to make the measurements in a closed tube: a loudspeaker at one end of the tube is the source of sound. The electrical impedance of the loudspeaker is employed as the frequency-controlling element in a bridge-stabilized oscillator: in a manner analyzed in detail, the length of the tube controls the sound frequency by means of the acoustic loading on the loudspeaker diaphragm. An audiofrequency comparator is described whereby the sound frequency can be very accurately measured by comparison with a standard frequency oscillator. An analysis is made of the accuracy of measurements that is expected. Technical memorandum no. 19. Contract N5 ori-76, Project order X, NR-014-903.

ATMOSPHERIC DIFFUSION FROM A POINT SOURCE by C. S. Yih. Colorado Agricultural and Mechanical College. Civil Engineering Dept., Fort Collins, Colo. Aug 1951. 10p Available from Civil Engineering Dept., Colorado A and M College, Fort Collins, Colo. PB 105523

1. Equations, Differential 2. Diffusion theory 3. Atmosphere - Diffusion 4. Mathematical equations and solutions.

Report no. 4 under Contract N9 onr-82401, NR 063-071/1-19-49.

AXIALLY SYMMETRIC POTENTIAL FLOW ABOUT ELONGATED BODIES OF REVOLUTION, by L. Landweber. U. S. David W. Taylor Model Basin, Carderock, Md. Aug 1951. 67p Microfilm $3.00, Photostat $8.75. PB 105150

An iteration formula for Fredholm integral equations of the first kind is applied in two new methods for obtaining the steady, irrotational, axisymmetric flow of an inviscid, incompressible fluid about a body of revolution. In the first method a continuous, axial distribution of doublets is sought as a solution of an integral equation of the first kind. A method of determining the end points and the initial trends of the distribution, and a first approximation to a solution of the integral equation are given. This approximation is then used to obtain a sequence of successive approximations whose successive differences furnish a geometric measure of the accuracy of an approximation. When a doublet distribution has

been assumed, the velocity and pressure can be computed by means of formulas which are also given. In the second method the velocity is given directly as the solution of an integral equation of the first kind. Here also a first approximation is derived and applied to obtain a sequence of successive approximations. In contract with the first method, which, in general, can give only an approximate solution, the integral equation of the second method has an exact solution. Both methods are illustrated in detail by an example. The results are compared with those obtained by other well-known methods. NS715-084. DWTMB 761.

COMPARATIVE STUDY OF MOMENTUM TRANSFER, HEAT TRANSFER, AND VAPOR TRANSFER PART II: FORCED CONVENTION, TURBULENT CASE, by C. S. Yih. Colorado Agricultural and Mechanical College. Civil Engineering Dept., Fort Collins, Colo. Jun 1951. 141p graphs, tables Available from Civil Engineering Dept., Colorado A and M College, Fort Collins, Colo. PB 105522

1. Flow, Turbulent - Theory. 2. Atmosphere - Turbulence 3. Heat - Transference - Theory 4. Mathematical equations and solutions 5. Vortex motion - Theory.

Report no. 2 under Contract N9onr-82401, NR063-071/1-19-49.

EXPERIMENTAL VALUES OF THE SURFACE TENSION OF SUPERCOOLED WATER, by Paul T. Hacker. U. S. National Advisory Committee for Aeronautics. Oct 1951. 19p photos, diagrs, graphs, table Microfilm $1.75, Photostat $2.50. PB 104951

The surface tension of water has been determined experimentally for the temperature range, 0° to -22.2° C. The weak inflection point in the surface-tension-temperature relation, as indicated by the International Critical Table values for temperatures down to -8° C, was substantiated by the measurements in the temperature range, 0° to -22.2°C. The surface tension increases at approximately a linear rate from a value of 76.96±0.06 dynes per centimeter at -8° C to 79.67±0.06 dynes per centimeter at -22.2° C. NACA TN 2510.

EXPERIMENTS ON THE ADDITION OF HEAT TO A GAS FLOWING IN A PIPE: PART I, by Gerald A. Sterbutzel. Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. Sep 1949. 21p photos, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105060

The design and operation of an apparatus used for determining the effect of heat addition to an air stream flowing through a duct are described. An electric heater was used to heat the flow. The results were in qualitative agreement with the theoretically predicted values, but the amount of heat that could be added was too small for accurate quantitative measurements. Contract N6ori 11911, NR-061-034. CAL HF 534-A-3.

MARINE MAMMALS OF THE PACIFIC WITH PARTICULAR REFERENCE TO THE PRODUCTION OF UNDERWATER SOUND, by Marie Poland Fish. Woods Hole Cceanographic Institution, Woods Hole, Mass. Jul 1949. 70p maps, tables Microfilm $3.00, Photostat $8.75. PB 105085

1. Sound, Underwater - Sources 2. Mammals, Marine - Pacific Ocean.

Technical report no. 8 on Contract N6 ori-195, T. O. I, NR-083-003.

SUMMARY OF MEASUREMENTS OF HEAT CONDUCTIVITY CARRIED OUT UNDER THE OFFICE OF NAVAL RESEARCH PROGRAM FROM JULY 1, 1947 TO JUNE 15, 1949, PREPARED FOR THE OFFICE OF NAVAL RESEARCH TASK ORDER XI, CONSTITUTING THE FINAL REPORT UNDER M.I.T. CONTRACT N5 ORI-78, PROJECT DESIGNATION NO. NR-058-037, by Frederick G. Keyes. Massachusetts Institute of Technology. Division of Industrial Cooperation. Oct 1949. 32p photos, drawings, graphs, tables Microfilm $5.50, Photostat $17.50. PB 105253

Heat conductivity data were obtained for air, O, CO_2, N, steam, and a CO_2-N mixture. Measurements were made at temperatures as high as 400°C and at pressures up to 150 atm. The cells used essentially consisted of 2 concentric Ag cylinders with the inner cylinder heated. Chromel-P and Alumel thermocouples measured the temperature drop across the gas-filled annulus. The rate of change of thermocouple e.m.f. with temperature, $\Delta E/\Delta t$, as a function of temperature was determined using Pt resistance thermometers. A heat station above the cell maintained the leads at the inner-cylinder temperature. In the steam cell, the heaters, thermocouples, and leads were encased in stainless steel tubes. In a strain-free cell, these components were in direct contact with the gas. Annulus dimensions of the steam cell were: 4.5 in., length, 0.8512 in., i.d.; and 0.90135 in., o.d. A conductivity value of 5.83×10^{-5} cal./cm./sec.°C was obtained in the steam cell for air, the calibrating substance, at 0°C and 1 atm. Around 200° and 307°C, the observed conductivity values for steam tended to be less and more, respectively, than the calculated values; no other trends were noted in the deviations. Steam conductivity values up to 350°C were less in all cases than these Timroth and Vargaftig values (Jnl. of Phys. (USSR) 2,101 (1940)). No simple addition rule appeared to relate the heat conductivity of a mixture to the conductivities of the components. Includes Reports 1-7.

TABLES OF EXACT LAMINAR-BOUNDARY-LAYER SOLUTIONS WHEN THE WALL IS POROUS AND FLUID PROPERTIES ARE VARIABLE, by W. Byron Brown and Patrick L. Donoughe. U. S. National Advisory Committee for Aeronautics. Sep 1951. 68p graphs, table Microfilm $3.00, Photostat $6.75. PB 105206

Exact solutions of the laminar boundary equations were computed and tabulated for a range of fixed values of Euler number, temperature ratio, and flow through a porous wall. Euler numbers are 0, 0.5, 1, and negative values to the separation point. Temperature ratios are 1, 2, and 4 for the impermeable wall and for two values of coolant flow. In addition, results from temperature ratios of 1/2 and 1/4 are given for the impermeable wall. For each case, boundary-layer thicknesses and heat-transfer and friction coefficients were computed and tabulated. NACA TN 2479.

Nuclear

MATERIAL REQUIRED TO CARRY OUT RADIOGRAPHY WITH COBALT 60, IRIDIUM 192, OR RADIUM, by A. Morrison. National Research Council of Canada. Division of Physics. Radiology Laboratory. Revised 21 August 1951. 1951. 18p photos, drawings, table Available from National Research Council of Canada, Ottawa, Canada. $.10. PB 99178r

1. Cobalt - Radioactivity - Canada 2. Iridium - Radiation - Canada 3. NRCC 2008, revised.

Divisional report no, PR-109. Revision of edition dated 25 August, 1949 (PB 99178).

RUBBER AND RUBBER PRODUCTS

DEVELOPMENT OF POLYMERS AND THEIR COMPOUNDS, MAINLY FOR THE PRODUCTION OF SYNTHETIC RUBBER. I. G. Farbenindustrie A. G., Huls, Ger. 1936-1945. 426f tables (Text in German) Microfilm $9.00, Enlargement Print $56.25. PB 105409

1. Rubber, Synthetic - Polymerization - Germany 2. Polymers - Research - Germany 3. Butadiene - Preparation - Germany 4. Esteramine - Preparation - Germany 5. Ketones, Vinyl - Preparation - Germany 6. Wofatit (Trade name) 7. Pergut (Trade name) 8. Chlorbune (Trade name) 9. Micro BIOS FD 2361/46, Frames 1-421, abstract.

English abstract available as PB 105409s. 7p. Microfilm $1.25, Photostat $1.25. Some frames will not reproduce well. Includes reports no. 70, 74-78, 80-81, 84-85, 88-91, 96, 105-109, 112-115, 117-118, 120, 125-126; Memoranda no. 4-5, 1941, no. 47, 1942, articles on preparation of esteramines, by Dr. Wolz and Dr. Graulich; memoranda on preparation of various chemicals; on experiments to separate traces of copper from water by use of Wolftit, by Dr. Thury; experiments by Dr. Meisenburge on reduction of vinylmethylketon; a lecture by Dr. Böhme on Pergut and Chlorbume; articles on butadiene manufacture.

GERMAN ACETYLENE CHEMICAL INDUSTRY: BUTADIENE. REPORTED by W. Hunter. British Intelligence Objectives Sub-Committee. Apr - May 1946. 63p diagrs, graph, tables Microfilm $3.00, Photostat $8.75. PB 105309

1. Acetylene chemistry - Research - Germany 2. Butadiene - Recovery from 1,4-butanediol - Germany 3. Butadiene - Recovery from 1,3-butanediol - Germany 4. 1,3-Butanediol - Dehydrogenation - Germany 5. 1,4-Butanediol - Dehydrogenation - Germany 6. I. G. Farbenindustrie A. G., Ludwigshafen, Ger. 7. Chemische Werke Hüls G.m.b.H., Hüls, Ger. 8. BIOS FR 1060, Item no. 22.

B.I.O.S. trip no. 1919. C.I.O.S. black list item 22, miscellaneous chemicals. Personnel of team: Mr. J. F. Ellis (Team leader), Dr. D. Brundrit, Mr. N. Dennis, Mr. W. Hunter, Dr. A.W.C. Taylor.

TASCHENBUCH FÜR DIE GUMMI-INDUSTRIE (REFERENCE BOOK FOR THE RUBBER INDUSTRY). I.G. Farbenindustrie A. G., Frankfort, Ger. 1942. 82f tables (Text in German) Microfilm $3.75, Enlargement Print $12.50. PB 105408

1. Rubber industry - Germany 2. Rubber, Synthetic - Germany 3. Rubber, Buna - Germany 4. Rubber - Accelerators - Germany 5. Rubber, Antioxidents - Germany 6. Rubber plasticizers - Germany 7. Micro BIOS FD 2360/46, Frames 1-81.

English abstract included. Abstract available as PB 105408s. 1p. Microfilm $1.25, Photostat $1.25.

STRUCTURAL ENGINEERING

BEHAVIOR OF A SIMPLY SUPPORTED COLUMN UNDER CONSTANT OR VARYING LOAD WITH TRANSVERSE DISPLACEMENT OF ONE POINT OF SUPPORT, by V. L. Salerno, Frances Bauer and James Sheng. Polytechnic Institute of Brooklyn. Dept. of Aeronautical Engineering and Applied Mechanics. Aug 1950. 75p diagrs, graphs Microfilm $3.50, Photostat $10.00. PB 105566

The theoretical solutions for the response of a simply supported column which sustains a constant axial-end load or an axial-end load which varies linearly with time were obtained when 1 end of the column underwent any prescribed lateral pulse displacement. It was assumed that the Al alloy column was loaded statically to a stress equal to 98% of the Euler column stress and a half-sine lateral displacement pulse with an amplitude of 10^{-2} in. was applied at time t = 9.8000 sec. The response of the column with a cohstant axial applied stress of $\sigma_c = 0.98\sigma_E$ is shown for several periods. The motion is vibratory in nature and quasiperiodic, the amplitudes and frequencies varying slowly with time. The time intervals between peaks after the pulse is removed as scaled from curves are 0.00077, 0.00076, and 0.00079 sec. respectively. These correspond closely to 0.000746 sec., the period of the third harmonic (n = 3) of the solution. This greatest response in the third harmonic is obtained because the period of the pulse differs very little from the period of the third harmonic of the loaded column. The motion of the center point of the column (x = L/2) will continue indefinitely with no radical change in either amplitude or frequency of vibration as long as friction is neglected. Typical motions in the interval are shown in curves. The time intervals between the peaks in each of the curves were approximately 0.00075 sec. This value represents the response of the most sympathetic mode (n = 3) to the pulse. Beyond this time, the oscillatory motion occurs about a point which is constantly moving away from the static equilibrium position. For higher loading speeds, the inertial effects will be more important and large deflections which signify failure will be reached well after the Euler stress is reached.

CAUSES OF DAMPNESS IN BUILDINGS. Gt. Brit. Dept. of Scientific and Industrial Research. Building Research Station, Watford, Eng. Aug 1951. 8p tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105231

1. Buildings - Dampness - Gt. Brit. 2. DSIR-BRD 33.

DYNAMIC MODELING FOR STRESS SIMILITUDE, by R. M. Hermes and C. S. Yen. Santa Clara. University, Santa Clara, Calif. Jul 1950. 48p photo, diagrs

graphs, tables Microfilm $2.50, Photostat $6.25. PB 105359

A structure is considered to be correctly modeled for dynamic stress similitude if the difference between the stresses predicted from the model and those developed in the prototype is less than about 10% of the latter. Beams were tested to determine if this accuracy could be obtained by using similitude relations resulting from previous work. Bars were mounted as cantilever beams and subjected to free vibration, forced vibration, and impulse tests; the effect of damping was studied. Results indicate that for applications where damping is neglected, similitude can be attained if the dimensionless radius of gyration is the same for prototype and model. Where internal damping is appreciable and external damping can be neglected, geometric similarity is a necessary condition. Technical report no. 2 under Contract N8 onr-523, T.O. I, Project NR 035-228.

EXPERIMENTAL DIAGRAMS OF DEFORMATION AND STRAIN DISTRIBUTION IN CURVED PLATES UNDER COMPRESSION, by K. B. Jackson and A. H. Hall. National Research Council of Canada. 1951. 149p diagrs, graphs, tables Available from National Research Council of Canada, Ottawa, Canada. $2.00. PB 105563

In a previous report on the behavior of curved plates in compression (N.R.C. AR-1) a considerable quantity of informative data was omitted for space considerations. These data, which are now presented, include stress-strain curves with which are identified diagrams of strain distribution and plate deformations for values of edge strain between zero and failure. The behaviour of approximately twenty representative plates is fully demonstrated covering a range of width to thickness ratio from 77 to 400, and ratios of plate thickness to radius of curvature from 0 to 1.6 x 10^{-3}. Aeronautical report AR-9. NRCC 2443.

EXPERIMENTAL STUDY OF THE BEHAVIOR OF BEAMS UNDER DYNAMICALLY APPLIED BENDING MOMENTS, by T.H.H. Pian, J. W. Mar, F. C. Hallowell, Jr. Massachusetts Institute of Technology. Dept. of Aeronautical Engineering. Oct 1950. 32p photos, diagrs, graphs Microfilm $2.25, Photostat $5.00. PB 105571

A pure bending moment was dynamically applied to beams of rectangular cross section and the curvature and bending moment were recorded on an oscillograph. Lead weights supported by a bomb shackle were released suddenly, resulting in dynamic application of the bending moment to the beam specimen through a whiffle-tree arrangement. The beam specimen was itself a part of the loading system. The test material, cold-rolled S.A.E. 1018-steel, does not exhibit a well-defined static yield point. Results indicate that the dynamically obtained curve of bending moment vs. curvature is essentially the same as the statically obtained curve. Contract N5ori-07833, NR-035-259.

INFLUENCE OF THE TESTING MACHINE ON THE FLEXURAL FAILURE OF PANELS, by W. S. Hemp. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Oct 1945. 6p diagrs, graph, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.45. PB 105220

The pin-ended length of a panel tested flat-ended in a compression testing machine is influenced by the flexibility of the machine. A system of elastic constants is defined to describe this influence and equations for the critical load developed. These constants are determined by stiffness measurements made on the testing machine and by calculation of the platten deformation at the area of contact with the panel. Finally, the degree of fixation achieved in the testing of typical panels is calculated and the results given in graphical form. Cover date is 1951. S. O. Code no. 23-2539. ARC RM 2539.

K. TEORII TONKIKH I TONKOSTENNYKH STERZHNEI (ON THE THEORY OF THIN AND THIN-WALLED RODS), by G. Yu Dzhanelidze. Oct 1951. 18p tables Microfilm $1.75, Photostat $2.50. PB 105500

An approximate theory for the torsion and bending of thin shells is developed. The theory is based on two fundamental assumptions: cross sections are unstrained in their own planes, and the longitudinal strain in the cross section can be represented by a planar distribution (the usual engineering assumption) and by a distribution proportional to the St. Venant warping. The torsion and bending problems are discussed in the light of these assumptions; the analysis is then applied to the free vibration of a thin shell in combined torsion and bending. Trans. from Prikladnaya matematika i mekhanika, v. 13, Nov. - Dec. 1949, p. 597-608. NACA TM 1309.

KRAV PA GOLVBELÄGGNINGAR, KOMPLEMENT TILL RAPPORTEN "GOLVLITTERATUR" AV BORIS BLOMGREN (FLOORING REQUIREMENTS, ADDITION TO THE REPORT "BIBLIOGRAPHY ON FLOORING"). Sweden. Statens Kommittee för Byggnadsforskning. 1951. 56p tables (Text in Swedish) Microfilm $2.75, Photostat $7.50. PB 105590

1. Flooring - Sweden 2. Sweden. Statens Kommittee för Byggnadsforskning. Rapporter nr. 23.

PROCEEDINGS OF THE SECOND ANNUAL STRUCTURAL ENGINEERING CONFERENCE, MARCH 16 AND 17, 1951. Florida. Engineering and Industrial Experiment Station, Gainesville, Fla. Oct 1951. 40p photos, drawings, graphs, tables Available from Florida Engineering and Industrial Experiment Station, University of Florida, Gainesville, Fla. PB 105510

1. Concrete, Prestressed 2. Steel - Welding 3. Structural engineering 4. Structural engineering conference, 2d, 1951, Gainesville, Fla. 5. F EES B47.

Engineering progress at the University of Florida, vol. V, no. 10. Contents: 1. Design of welded structures, by La Motte Grover. - 2. Structural steel research as conducted by the welding research council, by W. Spraragen. - 3. Shop and field practices in welding, by R. W. Cloves. - 4. Design of prestressed concrete, by D. L. Chaney. - 5. Processes and patents in prestressed concrete, by T. R. Crom. - 6. Current developments in prestressed concrete, by J. N. Hicks. - 7. The work of the structural division of

A.S.C.E. and recommendations for future development, by J. M. Garrelts.

RELATIVE STRUCTURAL EFFICIENCIES OF FLAT BALSA-CORE SANDWICH AND STIFFENED-PANEL CONSTRUCTION, by Ralph E. Hubka, Norris F. Dow and Paul Seide. U. S. National Advisory Committee for Aeronautics. Oct 1951. 29p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105511

An analysis is made and charts are presented for the determination of regions of efficient application of flat balsa-core sandwich and stiffened-panel construction for a large range of design requirements. Optimum sandwiches were found to have relatively low values of the ratio of core thickness to face thickness. NACA TN 2514.

ROOF BOLTING AND DUST CONTROL, by James Westfield, Floyd G. Anderson, C. W. Owings, John P. Harmon, and Leslie Johnson. U. S. Bureau of Mines. Aug 1951. 10p graph, tables Microfilm $1.25, Photostat $1.25. Limited supply available free from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. PB 105343

1. Mines and mining - Supports 2. Mines and mining - Dust control 3. BM IC 7615.

SECONDARY STRESSES IN THIN-WALLED BEAMS WITH CLOSED CROSS SECTIONS, by Stanley Urner Benscoter. U. S. National Advisory Committee for Aeronautics. Oct 1951. 104p diagrs Microfilm $4.50, Photostat $13.75. PB 105543

An accurate method of determining secondary stresses in thin-walled, uniform beams of closed cross section is presented. The cross sections are assumed to be preserved by closely spaced rigid diaphragms. In the first section of the paper the integrodifferential equation governing axial displacements is formulated and solved for a beam without longitudinal stiffeners. In the second section of the paper the corresponding summation-difference equation is developed and solved for a beam with stiffeners (flangers and stringers). The cross section, loading distribution, and end conditions are assumed to be arbitrary. NACA TN 2529.

STRESSES IN A TWO-BAY NONCIRCULAR CYLINDER UNDER TRANSVERSE LOADS, by George E. Griffith. U. S. National Advisory Committee for Aeronautics. Oct 1951. 34p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105502

A method, taking into account the effects of flexibility and based on a general eighth-order differential equation, is presented for finding the stresses in a two-bay, noncircular cylinder the cross section of which can be composed of circular arcs. Numerical examples are given for two cases of ring flexibility for a cylinder of doubly symmetrical (essentially elliptic) cross section, subjected to concentrated radial moment, and tangential loads. The results parallel those already obtained for shells with circular rings. NACA TN 2512.

TEXTILES AND TEXTILE PRODUCTS

ANTISHRINK TREATMENT OF WOOL BY MESSRS. HERCKEL & KIENLIN, ESSLINGEN, REPORTED BY W. BAIRD. BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE. C.I.O.S. BLACK LIST ITEM NO. 22. Dec 1945. 3f Microfilm $1.25, Enlargement Print $1.50. PB 105731

1. Herckel & Kienlin, Esslingen, Ger. 2. Wool - Treatment - Germany 3. Wool - Shrinking - Germany 4. BIOS FR 241 5. Micro BIOS FD 3035/48, Frames 1-3.

EVAPORATORS FOR VISCOSE SILK SPINNING BATH LIQUORS. British Intelligence Objectives Sub-Committee. n.d. 19f drawings (Legends in German) Microfilm $1.75, Enlargement Print $3.75. PB 105724

1. Aktiengesellschaft Kühnle, Kopp & Kausch, Frankenthal, Ger. 2. Evaporators - Design - Germany 3. Viscose - Spinning - Germany 4. BIOS FR 1865 5. Micro BIOS FD 1149/49, Frames 1-5. Abstract included.

FLAMEPROOFING OF FABRICS, A LITERATURE AND PATENT SURVEY, PREPARED by Francis D. Horigan and Cary B. Sage. U. S. Office of The Quartermaster General. Military Planning Division. Research and Development Laboratories. Technical Library. Mar 1951. 49p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $1.25. PB 105479

This bibliography constitutes a literature and patent survey on a research subject that is generally referred to as "flameproofing of fabrics". The compilation is arranged in reverse chronological order, the scope covering the years 1950-1935 inclusive. The intra-annual breakdown is alphabetical by title, the patent citations being interspersed with the journal articles. No attempt has been made at all-out inclusion. However, it can be reasonably stated that this literature and patent survey embraces each and every recognized method of fire and flameproofing developed during the inclusive years. An alphabetical "name" index, comprising the names of authors and inventors, together with a numerical "patent" index has been appended. QMC TL RS 18.

NOTABLE TECHNICAL DEVELOPMENT IN THE PRODUCTION OF RAYON AND STAPLE FIBRES IN GERMANY, by Dr. L. Thoria. British Intelligence Objectives Sub-Committee. B.I.O.S. trip no. 2305. 1946. 50f Microfilm $2.50, Enlargement Print $7.50. PB 105718

1. Rayon - Manufacture - Germany 2. Fibers, Staple - Manufacture - Germany 3. Carbon disulfide - Production - Germany 4. Kampf und Spindler, Düsseldorf, Ger. 5. Rheinische Kunstseide A. G., Krefeld, Ger. 6. Glanzstoff Courtauld G.m.b.H., Cologne, Ger. 7. Vereinigte Glanzstoff Fabriken A.G.

Obernburg, Ger. 8. Bemberg, J. P., A. G., Wuppertal, Ger. 9. Wacker, Alexander, Acetat Zellwolle Fabrik, Berghausen, Ger. 10. Deutsche Acetat-Kunstseide Fabrik Rhodiaceta, Freiburg, Ger. 11. Westfälischer Zellstoff A. G., Wildshausen, Ger. 12. Firma Okriftel, Okriftel, Ger. 13. Aschaffenburger Zellstoffwerke A. G., Aschaffenburg, Ger. 14. Chemische Fabrik Billwärder, Hamburg, Ger. 15. Aktiengesellschaft für Chemische Industrie, Gelsenkirchen, Ger. 16. Textil Forschungsanstalt Krefeld E. V., Krefeld, Ger. 17. Institut für Textilchemie, Badenweiler, Ger. 18. Deutsches Textilforschungsinstitut, Reutlingen, Ger. 19. Haas, F., Lennep, Ger. 20. Kleinewerfer & Söhne, Maschinenfabrik, Krefeld, Ger. 21. BIOS FR 1296 22. Micro BIOS FD 851/49, Frames 1-48.
Abstract included.

PREPARATION OF VEGETABLE FIBERS, HORSE AND HOG HAIR WITHIN GERMANY. B.I.O.S. TRIP NO. 2804, by D. M. Shaw, C. A. Dunn, W. Fennell. British Intelligence Objectives Sub-Committee. Mar 1947. 34f Microfilm $2.25, Enlargement Print $6.25. PB 105716
1. Fibers, Vegetable - Production - Germany 2. Horse hair - Production - Germany 3. Swine - Hair - Production - Germany 4. BIOS FR 1308 5. Micro BIOS FD 724/49, Frames 2-33.
Abstract included.

TRANSPORTATION EQUIPMENT

Aeronautics

Aircraft

AERODYNAMIC BEHAVIOR OF A HARMONICALLY OSCILLATING FINITE SWEPTBACK WING IN SUPERSONIC FLOW, by Chieh-Chien Chang. U. S. National Advisory Committee for Aeronautics. Oct 1951. 76p diagrs, graphs Microfilm $3.50, Photostat $10.00. PB 105316
By an extension of Evvard's "diaphragm" concept outside the wing tip, two approximate methods are presented for calculating the aerodynamic behavior of harmonically oscillating, sweptback finite wings with both supersonic leading and trailing edges - one expressing the integration in terms of Fresnal integrals and the second one similar to the first except that a series expansion of the source-strength function is used. If the wing frequency parameter is small both methods give accurate results in the engineering sense without requiring undue computing skill. A number of graphs are presented to show pressure distribution of the wings at different Mach numbers, sweepback angles, and frequency parameters. Comparisons of pressure coefficients calculated from present methods and exact two dimensional solutions based on linearized theory are made. NACA TN 2467.

FLIGHT INVESTIGATION OF A MECHANICAL FEEL DEVICE IN AN IRREVERSIBLE ELEVATOR CONTROL SYSTEM OF A LARGE AIRPLANE, by B. Porter Brown, Robert G. Chilton and James B. Whitten. U.S. National Advisory Committee for Aeronautics. Oct 1951. 47p photos, diagrs, graphs Microfilm $2.50, Photostat $6.25. PB 105317
Data are presented showing the flight characteristics of a large airplane having a control-surface booster and mechanical feel device in the elevator-control system. The tests were made with various force gradients provided by the adjustable feel device. The booster was set to operate at a very high boost ratio throughout the tests so that the measured or apparent stick-free stability would be influenced only slightly by the aerodynamic hinge moments. The results show the effect of the feel device on the handling qualities of the test airplane and also the design features which should be incorporated in such devices. NACA TN 2496.

AIR FORCES AND MOMENTS ON TRIANGULAR AND RELATED WINGS WITH SUBSONIC LEADING EDGES OSCILLATING IN SUPERSONIC POTENTIAL FLOW, by Charles E. Watkins. U. S. National Advisory Committee for Aeronautics. Sep 1951. 44p diagrs, graphs Microfilm $2.50, Photostat $6.25. PB 105140
This analysis treats the air forces and moments in supersonic potential flow on oscillating triangular wings and a series of sweptback and arrow wings with subsonic leading edges and supersonic trailing edges. The linearized velocity potential for the wings undergoing sinusoidal torsional oscillations simultaneously with vertical translations is derived in the form of a power series in terms of a frequency parameter. Although as many terms of such a series expansion as may be desired can be determined, the terms after the first few become very cumbersome. Closed expressions that include the reduced frequency to the third power, an order which is sufficient for a large class of practical applications, are given for the velocity potential and components of chordwise section force and moment coefficients. NACA TN 2457.

AN APPROXIMATION SIMPLIFYING WING FLUTTER CALCULATIONS, by G. A. Naylor. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Apr 1942. 10p graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.75. PB 105222
This report shows that the application of classical flutter theory to the determination of wing flexural-torsional flutter speeds is considerably simplified by the omission of a term which is usually the very small difference between two small quantities. With this simplification it is possible to derive a formula giving the critical speed explicity in terms of the dynamical coefficients. Numerical examples show that this approximation gives practically the same flutter speeds as the complete classical theory, even when the coefficients are given values which do not normally occur. A simpler approximate formula is obtained by a combination of the first approximation with Pugsley's simplified theory; this approximation gives flutter speeds for normal wings which agree with those from classical theory. Cover date is 1951. S. O. Code no. 23-2605. ARC RM 2605.

COMPARISON OF HEAT TRANSFER FROM AIRFOIL IN NATURAL AND SIMULATED ICING CONDITIONS,

by Thomas F. Gelder and James P. Lewis. U. S. National Advisory Committee for Aeronautics. Sep 1951. 51p photos, diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105137

An experimental investigation of the heat transfer from an 8-foot-chord airfoil model in clear air and in simulated icing conditions was conducted in the icing tunnel. These results are compared with those obtained in a flight investigation with the same model at similar operating conditions. The tunnel results indicate the effect of tunnel turbulence by the forward movement of transition from laminar to turbulent heat transfer. The flight results indicate that the convective heat transfer in icing is considerably different from that measured in clear air and only slightly different from that obtained in the tunnel during simulated icing. NACA TN 2480.

COMPARISON OF THE TURBULENT BOUNDARY-LAYER GROWTH ON AN UNSWEPT AND A SWEPT WING, by John M. Altman and Nora-Lee F. Hayter. U. S. National Advisory Committee for Aeronautics. Sep 1951. 30p photos, diagr, graphs Microfilm $2.00, Photostat $3.75. PB 105141

Turbulent boundary-layer measurements are presented for a 45° swept and a two-dimensional unswept wing. A comparison is made of the displacement thickness, the momentum thickness, and the shape parameters for the two wings based on the component of velocity normal to the leading edge. The tests were conducted at a Reynolds number of about 4 million based on the component of velocity normal to the leading edge. NACA TN 2500.

DATA ON FLIGHT LOADS OBTAINED WITH MILLER RECORDING EQUIPMENT, WITH PARTICULAR REFERENCE TO TEST FLIGHTS IN LANCASTER PD119, by Anne Burns. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 33p Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.40. PB 105160

A technique is presented for using Miller recording equipment to obtain statistical data on flight loads. The technique includes modifying the equipment and taking sample records of the flight loads. Considerable labour is required to extract statistical data from the records, and Miller recording equipment should only be used until more suitable equipment has been developed. ARC CP 48.

EFFECT OF GROUND INTERFERENCE ON THE AERODYNAMIC CHARACTERISTICS OF A 42° SWEPTBACK WING, by G. Chester Furlong and Thomas V. Bollech. U. S. National Advisory Committee for Aeronautics. Oct 1951. 24p diagrs, graphs, photos Microfilm $2.00, Photostat $3.75. PB 105281

The effects of ground interference on the aerodynamic characteristics of a 42° sweptback wing have been determined at distances above the ground 0.68 and 0.92 of the mean aerodynamic chord (measured from the 0.25 mean aerodynamic chord). The wing was tested without flaps and with inboard trailing-edge split and outboard leading-edge flaps deflected. The wing had an aspect ratio of 4, a taper ratio of 0.625, and NACA 64_1-112 airfoil section perpendicular to the 0.273 chord line. The results are, in general, comparable to those reported for unswept wings. The longitudinal stability at the stall was not materially affected at the ground heights of the present tests. NACA TN 2487.

EMPIRICAL RELATION BETWEEN INDUCED VELOCITY, THRUST, AND RATE OF DESCENT OF A HELICOPTER ROTOR AS DETERMINED BY WIND-TUNNEL TESTS ON FOUR MODEL ROTORS, by Walter Castles, Jr. and Robin B. Gray. U. S. National Advisory Committee for Aeronautics. Oct 1951. 70p photos, diagrs, graphs, tables Microfilm $3.00, Photostat $8.75. PB 105417

The empirical relation between the induced velocity, thrust, and rate of vertical descent of a helicopter rotor was calculated from wind-tunnel force tests of four model rotors by the application of blade element theory to the measured values of the thrust, torque, blade angle, and equivalent free-stream rate of descent. The tests covered the useful range of the ratio of thrust coefficient to effective solidity and the range of vertical descent from hovering to descent velocities slightly greater than those for autorotation. Possible sources of discrepancy between previous flight and wind-tunnel test data are discussed and the principal effects of blade taper and twist on the vertical-descent characteristics are evaluated. NACA TN 2474.

EXAMPLES OF THREE REPRESENTATIVE TYPES OF AIRFOIL-SECTION STALL AT LOW SPEED, by George B. McCullough and Donald E. Gault. U. S. National Advisory Committee for Aeronautics. Sep 1951. 52p photo, diagrs, tables Microfilm $2.75, Photostat $7.50. PB 105211

A summary of airfoil-section stalling characteristics, based on experimental investigations of five airfoil sections, is presented. Section stalling characteristics of three types are considered and are designated: trailing-edge stall, leading-edge stall, and thin-airfoil stall. The corresponding boundary-layer flows are discussed, and illustrative examples of the force, moment, pressure-distribution, and boundary-layer characteristics of each type are furnished. NACA TN 2502.

EXPERIMENTAL STUDY OF WATER-PRESSURE DISTRIBUTIONS DURING LANDINGS AND PLANING OF A HEAVILY LOADED RECTANGULAR FLAT-PLATE MODEL, by Robert F. Smiley. U. S. National Advisory Committee for Aeronautics. Sep 1951. 40p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105139

Water-pressure, velocity, draft, wetted length, and acceleration measurements are presented for smooth-water landing and planing tests of a rectangular flat-plate model. Landings were made at fixed trims between 6° and 45°, for flight-path angles between 2° and 20°, with beam-loading coefficients of 18.8 and 36.5. Planing runs were made for trims between 6° and 45°. For landings, the experimental pressure coefficients based on the equivalent planing velocity appear to be substantially independent of the deceleration of the model. The peak pressures were approximately equal to the dynamic pressure corresponding to the velocity of the peak-pressure point. NACA TN 2453.